

# CHAPTER 5

## CUMULATIVE IMPACTS

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### 5.1 CUMULATIVE IMPACTS

This section presents the likely cumulative impacts on the human and natural environment that could occur from implementing the alternatives presented in **Chapter 2, Alternatives**. This section is organized by topic, similar to **Chapter 3, Affected Environment**.

Cumulative impacts are effects on the environment that result from the impact of implementing any one of the Oregon Greater Sage-Grouse RMPA/EIS alternatives. These effects are in combination with other actions outside the scope of this plan, either within the planning area or next to it. Cumulative impact analysis is required by CEQ regulations because environmental conditions result from many different factors that act together. The total effect of any single action cannot be determined by considering it in isolation but must be determined by considering the likely result of that action in conjunction with many others.

The evaluation of potential impacts considers incremental impacts that could occur from the proposed project, as well as impacts from past, present, and reasonably foreseeable future actions. Management actions could be influenced by activities and conditions on adjacent public and non-public lands beyond the planning area boundary; therefore, assessment data and information could span multiple scales, landownerships, and jurisdictions. These assessments involve determinations that often are complex and, to some degree, subjective.

#### 5.1.1 Cumulative Analysis Methodology

The cumulative impacts discussion that follows considers the alternatives in the context of the broader human environment, specifically, actions that occur outside the scope and geographic area covered by the planning area. Cumulative impact analysis is limited to important issues of national, regional, or local significance.

Because of the broad nature of the RMPA and cumulative assessment, the analysis tends to be broad and generalized to address effects that could occur from a reasonably foreseeable management scenario, combined with other reasonably foreseeable activities or projects. Consequently, this assessment is primarily qualitative for most resources because of a lack of detailed information that would result from project-level decisions and other activities or projects.

Quantitative information is used whenever available and as appropriate to portray the magnitude of an impact. The analysis assesses the magnitude of cumulative impacts by comparing the environment in its baseline condition with the expected impacts of the alternatives and other actions in the same geographic area. The magnitude of an impact is determined through a comparison of anticipated conditions against the naturally occurring baseline in the affected environment (see **Chapter 3**, Affected Environment) or the long-term sustainability of a resource or social system.

The following factors were considered in this cumulative impact assessment:

- Federal, nonfederal, and private actions
- Potential for synergistic effects or synergistic interaction between effects
- Potential for effects across political and administrative boundaries
- Other spatial and temporal characteristics of each affected resource
- Comparative scale of cumulative impacts across alternatives

Temporal and spatial boundaries used in the cumulative analysis are developed on the basis of resources of concern and actions that might contribute to an impact. The baseline date for the cumulative impacts analysis is 2012; the temporal scope of this analysis is a 20-year planning horizon. Land use planning documents are generally evaluated on a ten-year cycle.

In 1954 the Western Association of Fish and Wildlife Agencies (WAFWA) formed a technical committee to monitor the distribution and abundance of GRSG. WAFWA formalized a program of interstate coordination and cooperation in 1995 to address the issues of GRSG population losses and degradation of sagebrush ecosystems. The BLM, USFWS, and US Forest Service formally joined with WAFWA in range-wide conservation efforts in 2000 (Stiver et al. 2006).

WAFWA entered into a contract with the USFWS in 2002 to produce a complete conservation assessment for GRSG and its habitat. *Greater Sage-Grouse Comprehensive Conservation Strategy* (Stiver et al. 2006) is one of the results of the assessment and is a conservation strategy for GRSG and sagebrush habitats. Seven WAFWA Management Zones are established based on GRSG populations within floristic provinces. Floristic provinces (Connelly et al. 2004)

were used to delineate Management Zones because they reflect ecological and biological issues and similarities, not political boundaries. In addition, the vegetation communities found in the floristic provinces, as well as the management challenges, within a Management Zones are similar; GRSG and their habitats are likely responding similarly to environmental factors and management actions (Stiver et al. 2006).

Spatial boundaries vary and are larger for resources that are mobile or migrate (e.g., migratory birds) compared with stationary resources. Occasionally, spatial boundaries could be contained within the planning area boundaries or an area within the planning area. Spatial boundaries were developed to facilitate the analysis and are included under the appropriate resource section heading. The cumulative effects analysis for all topics included an analysis of cumulative effects at the planning area level. For GRSG in Oregon, it included an analysis at the WAFWA Management Zones 4 and 5, in addition to the planning level analysis. WAFWA Management Zones are biologically based delineations that were determined by GRSG populations and subpopulations identified within seven floristic provinces. Analysis at this level enables the decision maker to understand the impacts on GRSG at a biologically meaningful scale.

#### **5.1.2 Past, Present, and Reasonably Foreseeable Future Actions**

Past, present, and reasonably foreseeable future actions are considered in the analysis to identify the following:

- Whether and to what extent the environment has been degraded or enhanced
- Whether ongoing activities are causing impacts
- What are the trends for activities in and impacts on the area

Projects and activities are evaluated on the basis of the following:

- Proximity
- Connection to the same environmental systems
- Potential for subsequent impacts or activity
- Similar impacts
- The likelihood a project will occur
- Whether the project is reasonably foreseeable

Projects and activities considered in the cumulative analysis were identified through meetings held with cooperators and BLM employees with local knowledge of the area. Each was asked to provide information on the most influential past, present, or reasonably foreseeable future actions. Additional information was obtained through discussions with agency officials and review of publicly available materials and Web sites.

Past actions within the geographic scope are taken into consideration to provide context for the cumulative effects analysis (40 CFR, Part 1508.7). Effects of past actions and activities are manifested in the current condition of the resources, as described in **Chapter 3**, Affected Environment.

Present actions within the geographic scope are also considered (40 CFR, Part 1508.7). Present actions are those that are ongoing at the time of the analysis.

Reasonably foreseeable future actions are those that have been committed to or known proposals that would take place within a 20-year planning period and would be typically reviewed during the five-year evaluation. Reasonably foreseeable future actions within the geographic scope and the timeframe of the analysis are also considered (40 CFR, Part 1508.7); they are not limited to those that are approved or funded.

Reasonably foreseeable future action scenarios are projections made to predict future impacts; they are not actual planning decisions or resource commitments. Projections, which have been developed for analytical purposes only, are based on current conditions and trends and represent a best professional estimate. Unforeseen changes in such factors as economics, demand, and federal, state, and local laws and policies could result in different outcomes than those projected in this analysis.

A reasonably foreseeable development (RFD) scenario is the basis for analyzing environmental impacts from future leasing and development of mineral resources in a decision area. A variety of factors (e.g., economic, social, and political) are beyond the control of the BLM and will influence the demand for mineral resources. Therefore, an RFD scenario is a best professional estimate of what may occur if BLM-administered lands are leased. It is not intended to be a “maximum-development” scenario; however, it is biased toward the higher end of expected development and shows where the potential development might occur.

Leasing and developing geothermal resources in the Oregon Sub-region are based on the RFD scenario described in **Section 4.1.1**, Analytical Assumptions, of the Final Programmatic Environmental Impact Statement for Geothermal Leasing in the Western United States (BLM and Forest Service 2008; the RFD scenario was created for a different analysis and not this RMPA/EIS). Additional information on this Final EIS is provided on the BLM website at [http://www.blm.gov/wo/st/en/prog/energy/geothermal/geothermal\\_nationwide/Documents/Final\\_PEIS.html](http://www.blm.gov/wo/st/en/prog/energy/geothermal/geothermal_nationwide/Documents/Final_PEIS.html).

Excluding geothermal resources, RFD scenarios for minerals and mineral potential reports were not completed for this RMPA/EIS. All future looking estimates are based on broad-scale “trends” review, which is an opinion, as opposed to a methodological approach.

Other potential future actions have been considered and eliminated from further analysis. This was because there is a small likelihood these actions would be pursued and implemented within the life of the plan or because so little is known about the potential action that formulating an analysis of impacts is premature.

In addition, potential future actions protective of the environment (such as new regulations related to fugitive dust emissions) have less likelihood of creating major environmental consequences alone, or in combination with this planning effort.

Such federal actions as species listing would require the BLM to reconsider decisions created from this action because the consultations and relative impacts might no longer be appropriate. These potential future actions may have greater capacity to affect resource uses within the planning area; however, until more information is developed, no reasonable estimation of impacts could be developed.

Data on the precise locations and overall extent of resources within the planning area are considerable, although the information varies according to resource type and locale. Furthermore, understanding of the impacts on and the interplay among these resources is evolving. As knowledge improves, management measures (adaptive or otherwise) would be considered to reduce potential cumulative impacts, in accordance with law, regulations, and applicable RMPs.

Projects and activities identified as having the greatest likelihood to generate potential cumulative impacts when added to the Oregon Greater Sage-Grouse RMPA/EIS alternatives are displayed in **Table 5-1**, Reasonably Foreseeable Future Actions. In addition, there are on-going planning efforts both within (e.g. Baker RMP) and adjacent to the sub-region (e.g. Nevada/California Sub-region GRSG LUPA/EIS) with which this planning effort has been coordinated and aligns. The collective actions proposed in these ongoing efforts could result in cumulative effects throughout the Great Basin Region, including on this Oregon Greater Sage-Grouse RMPA/EIS.

**Table 5-1**  
**Reasonably Foreseeable Future Actions**

<b>Oregon Sub-Region Sage-Grouse Land Use Plan Amendments Reasonably Foreseeable Future Actions</b>					
<b>Name</b>	<b>Description</b>	<b>Location</b>	<b>Developed Area</b>	<b>Status of Action</b>	<b>GRSG Population</b>
Boardman to Hemingway (B2H) Transmission Line EIS	B2H is an approximately 300-mile 500-kV transmission line proposal.	From Boardman, Oregon, to Melba, Idaho	Multiple population areas, including Morrow, Umatilla, Union, and Malheur Counties in Oregon and Owyhee and Canyon Counties in Idaho  Shoshone-Paiute Tribes of the Duck Valley Indian Reservation, the Confederated Tribes of the Umatilla Indian Reservation, the Shoshone-Bannock and the Burns Paiute Tribes	Project under NEPA review, estimated ROD in 2014.	Baker
<b>Burns District</b>					
North Steens Ecosystem Restoration Project	Treat expansion western juniper on a landscape scale, encompassing approximately 336,000 acres CMPA to return vegetation communities to historic	Steens Mountain Cooperative Management and Protection Area	Steens Mountain Cooperative Management and Protection Area	Ongoing	Western Great Basin

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	compositions and reduce hazardous fuel loads.				
Lake Creek/Boone Canyon Forest Restoration Project	Thin, pile, and burn expansion juniper and ponderosa pine. Future planning includes an underburn.	Three Rivers Resource Area	Three Rivers Resource Area	Ongoing	Central Oregon
Three Rivers Underburning Project	Prescribed fire to control expansion juniper and ponderosa pine.	Three Rivers Resource Area	Three Rivers Resource Area	Ongoing	Central Oregon/Northern Great Basin
Forks of Poison Creek/Devine Ridge Vegetation Management Restoration:	Prescribed fire to control expansion juniper and ponderosa pine. The burned area was seeded in spring 2011. Ongoing work includes maintaining several aspen fences in the burn area.	Three Rivers Resource Area	Three Rivers Resource Area	Ongoing	Central Oregon/Northern Great Basin
Slick Ear/Claw Creek Forest Restoration Project	The goals of the project are to reduce hazardous fuels, restore plant communities, and improve wildlife habitat diversity. The	Three Rivers Resource Area	Three Rivers Resource Area	Ongoing	Central Oregon

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	emphasis on treatments will be in forested areas.				
The SHED Forest Restoration Project	Implementation plans include thinning, piling, pile burning, and implementing a forest underburn.	Three Rivers Resource Area	Three Rivers Resource Area	Ongoing	Northern Great Basin
Camp Harney/Cow Creek Ecological Restoration Project	Implementation plans include thinning, piling, pile burning, and implementing a forest underburn.	Three Rivers Resource Area	Three Rivers Resource Area	Ongoing	Northern Great Basin
Dry Lake Ecological Restoration Project:	Implementation plans include thinning, piling, pile burning, and implementing a forest underburn.	Three Rivers Resource Area	Three Rivers Resource Area	Ongoing	Central Oregon
Five Creeks Rangeland Restoration Project	A landscape-scale vegetation treatment encompassing approximately 73,500 acres (approximately 26,000 acres in the CMPA) to return	Three Rivers and Andrews/Steens Resource Areas	Three Rivers and Andrews/Steens Resource Areas	Ongoing	Western Great Basin/ Northern Great Basin



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	vegetation communities to historic compositions and reduce hazardous fuel loads. Various forms of prescribed fire and mechanical treatments have been used to reduce influence of encroaching western juniper.				
North Steens 230-kV Transmission Line Project	North Steens is a 29-mile 230-kV transmission line that would convey 104 MW of power generated from wind farms proposed on private land on the north side of Steens Mountain.	Project in Harney County on the north side of Steens Mountain	Harney County	Project approved and ROD signed in December 2011; in litigation.	Western Great Basin/ Northern Great Basin
District-wide noxious weed treatments	Ongoing interagency efforts with Oregon Department of Agriculture and Harney County.	Harney County	Wide spread across Harney County	Ongoing	Western Great Basin/ Northern Great Basin/Central Oregon

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Steens Mountain Comprehensive Recreation Plan	Multiyear plan to manage recreation on Steens Mountain, including maintaining facilities, creating new facilities and trails, closing roads, and providing interpretation.	Steens Mountain Cooperative Management and Protection Area	Steens Mountain Cooperative Management and Protection Area	EA to go out for public comment summer of 2013.	Western Great Basin
Wild Horse gathers	Gather wild horses.	District-wide	District-wide	Ongoing	Western Great Basin/Northern Great Basin/Central Oregon
Holloway ES&R	Rehabilitation following wildland fire.	Trout Creek Mountain	Andrews Resource Area	Some implementation complete.	Western Great Basin
Miller Homestead ES&R	Rehabilitation following wildland fire.	Catlow Valley	Andrews Resource Area	Some implementation complete.	Western Great Basin
District-wide Vegetation Management (Weed EA)	Use new chemicals to treat noxious and invasive species.	Harney County	Harney County	EA in process.	Western Great Basin/Northern Great Basin/Central Oregon
Wagon Tire Wind Energy Development Project	Develop a wind farm.	Harney County	Harney County	Beginning studies and consultation, initiating NEPA analysis; decision expected 2016.	Western Great Basin/Central Oregon

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Buckskin Mountain Wind Energy Development Project	Develop a wind farm.	Harney County	Harney County	Beginning studies and consultation, initiating NEPA analysis; decision expected 2016.	Western Great Basin
<b>Lakeview District</b>					
Locatable mining	<p>Two areas in the Lakeview RA, where locatable mining activity is ongoing, either will continue or will expand in the near future; Tucker Hill and Rabbit Basin Sunstone areas</p> <p>Tucker Hill, active 23-acres perlite mine, authorized to expand to 75 acres.</p> <p>Rabbit Basin Sunstone area; approximately 43 open notices and plans of operations for sunstone mines currently affecting 61 acres. Three to five new open</p>	Lake, Oregon		Ongoing	Western Great Basin

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	notices received or plans of operations approved each year, for up to 25 acres of additional disturbance added each year.				
Pacific Direct Intertie Upgrade and Maintenance	Maintain and upgrade the existing Bonneville Power Administration power line from Columbia River south to the northern Nevada border.	Deschutes and Lake, Oregon		2013-2015	Western Great Basin and Central Oregon
South Warner Sagebrush Sage-Grouse Habitat Restoration	Juniper removal from a 50,000-acre South Warner Rim project area adjacent to the pipeline.	Lake, Oregon		2012-2022	Western Great Basin
Oregon Community Wind Energy Project	Construction of 6 to 7 wind turbines near Big Valley and associated power line ROW paralleling Deep Creek to Adel Substation.	Lake, Oregon		Initiating NEPA analysis (2014-2015).	Western Great Basin

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	This project is now over. Taking down testing tower.				
Prescribed Burning—Green Mountain Hayes Butte Bridge Creek Highway 31	Burning of individual juniper trees in sagebrush habitat to improve sagebrush/sage-grouse habitat up to 1,100 acres.	Lake, Oregon		2013	Central Oregon
Silver Creek juniper cutting	Cutting juniper in sagebrush habitat to improve sagebrush/sage-grouse habitat (1,000 acres).	Lake, Oregon		2013	Central Oregon
Brown's Valley Paisley Desert fuel break mowing	Mowing fuel breaks next to roads to prevent large-scale wildfires in sagebrush habitat	Lake, Oregon		2014-2015	Central Oregon
<b>Prineville District</b>					
West Butte	West Buttes includes a permanent 4.5-mile access road, a pole-mounted 115-kV electrical transmission line, a 14.4-kV electrical	32 miles east of Bend, Oregon		NEPA and ROD completed 2011. Implementation date unknown.	Central Oregon

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	utility line that would convey 104 MW of power generated from 52 wind turbines proposed on private land.				
Playa EA	Cut up to 2,000 acres of juniper per year. Close about 10 miles of road in playas. Exclude livestock grazing on up to 6,500 acres in 10 playas. Effects on sage-grouse, other wildlife.	South of Hampton, Oregon		NEPA in progress. ROD and implementation 2013.	Central Oregon
High Desert Shrub Steppe EA	Cut or burn up to 10,000 acres of juniper per year. Effects on GSRG.	Between Millican and Hampton, Oregon		NEPA and ROD completed 2011. Implementation ongoing through 2031.	Central Oregon
District-wide herbicide EA	Treat noxious and invasive weeds. Effects on a variety of resources.	Entire Prineville District		NEPA in progress. Expect ROD 2014 and implementation 2014 thru 2034.	Central Oregon
Glass Buttes communication site	Communication site upgrades on about 5 acres, and RMP amendment for	Near Hampton, Oregon		NEPA in progress. ROD expected fall 2013.	Central Oregon

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	visual resources (VRM Class II to VRM Class IV) on about 45 acres. Effects on visual resources, public safety.				
Multiple grazing permit renewals	Renew 37 grazing permits and leases. Effects on local economy, wildlife.	Various areas in Prineville District		NEPA in progress. Expect ROD late 2013.	Central Oregon
John Day Basin RMP revision (allowable/prescriptions and management direction; RMPs are NOT implementation actions)	Protect areas for wilderness characteristics (e.g., no wind turbines) and close areas to OHVs. Effects on motorized recreation, wilderness character, and various other resources.	John Day Basin (northeast side of Prineville District)		ROD expected winter 2013.	Historic Habitat
<b>Vale District</b>					
Baker Habitat Restoration and Fuels Treatment projects	Multiyear phased hazardous fuels and wildlife habitat restoration project on approximately 45,000 acres.	Baker County, 7 to 25 air miles southwest of Baker City	Baker County	ROD and FONSI signed; EA distributed and public comment received.	Baker population and Great Basin Core population

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District-wide noxious weed treatments	Ongoing interagency effort with Oregon Department of Agriculture and eastern Oregon counties.	Vale District counties in Oregon and Washington	Widespread across eastern Oregon	Continuing.	Baker population and Great Basin Core population
Mormon Basin Fuels Treatment	Largely juniper reduction. Focus is on "C" allotments in northern Malheur County, in coordination with OWEB funding and ODFW habitat management projects.	Northwest Malheur County	Widespread, central Vale District	In planning.	Great Basin Core population
High Bar/Upper and Lower Pine Creek Placer Mining Project	Up to 250 acres of activity would be disturbed for mineral extraction.	Baker County, near the town of Hereford, Oregon	Baker County	ROD pending, EA distributed, comments received. FONSI signed.	Great Basin PGH population
Malheur Queen Placer	Approximately 800 acres approved for development of placer gold extraction.	North-central Malheur County	Malheur and Baker Counties	ROD and FONSI signed; development underway.	Great Basin Core population
Advance Testing for Natural Gas	Proponent is developing planning to test for natural gas.	Northern Malheur County	Northern Malheur County	Only notice of testing locations provided. The BLM has met in the field with proponent.	Great Basin Core population



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				Note that significant effort is underway across the state line in Idaho investigating natural gas.	
Grassy Mountain Gold	Expansion of gold mine on private lands. Access crosses BLM-administered lands.	Northern Malheur County		Plans are anticipated at an unknown date. The proponent is completing baseline studies to fulfill state permits. Current activity is on private lands. Several coordination meetings have already been held.	Great Basin Core population
Aurora Project	Uranium extraction proposed. Project area within historic mercury mine area.	South-central Malheur County, along Nevada border. Transport of material and supplies would likely be from Oregon south into Nevada.	Mid-scale area effected at the socioeconomic level (Nevada, Idaho, and Oregon); project disturbance projected to be localized.	Initial coordination with proponent; site has been tested for development potential.	Great Basin Core population

### 5.1.3 Greater Sage-Grouse and Sage-Grouse Habitat

The cumulative effects analysis study area extends beyond the planning area boundary and consists of WAFWA GRSG Management Zones IV and V. This RMPA/EIS contains a quantitative cumulative effects analysis for GRSG habitat within the planning area boundary. At the larger WAFWA Management Zone level, the analysis is primarily qualitative. Data and information to enable a more comprehensive quantitative analysis that become available between the draft RMPA/EIS and the final may include the following:

- Ongoing LUPAs and revisions
- State plans that may not yet be complete
- Coordination with states and agencies during consistency reviews
- Data from lands not administered by the BLM

Those data that become available will be compiled and included in the quantitative cumulative effects analysis for GRSG in the final RMPA/EIS.

The time frame for this analysis is 10 years, because land use planning documents are generally evaluated on a ten-year cycle. The assumptions and indicators follow those established for the analysis of direct and indirect effects in Chapter 4.

#### **WAFWA Management Zone IV**

Management Zone IV consists of GRSG populations in the Snake River Plains: east-central Idaho, southwest Montana, Snake-Salmon-Beaverhead, Belt Mountains, Weiser, northern Great Basin, Box Elder, and Sawtooth (Garton et al. 2011). The three most substantial threats to GRSG and their habitats occurring across populations in WAFWA Management Zone IV are weed spread, fire, fragmentation, isolation and small population size (USFWS 2013a).

The Baker and Northern Great Basin GRSG populations in Oregon are within this management zone. The most productive sites on the deep, moist soils of the Snake River Plains and along the Malheur River were converted to agriculture in the late 1800s and early 1900s. As a result, many populations in the region are small or isolated, with the exception of those in central Idaho (watershed of the Snake-Salmon-Beaverhead Rivers) and the northern Great Basin (USFWS 2013a). Habitat availability is a primary limiting factor in this region due to the combination of land use change, leading to fragmentation and isolation and disturbances, primarily from fire (Manier et al. 2013).

Most of the sagebrush in this management zone is federally managed (Knick 2011), but local projects, such as removing spring developments, addressing juniper encroachment, and restoring native grasses, may be more important than rangewide effects because of habitat quality and connectivity to other GRSG populations in the area.

Geothermal and wind energy development potential is high throughout Management Zone IV. (See **Table 5-1** for a list of proposed geothermal and wind energy projects in Management Zone IV.) Few oil and gas wells exist there, and less than 350,000 acres (1 percent) of GRSG habitats are leased for federal fluid mineral exploration. Coal and solar potential are also low throughout this management zone. Agricultural development influences 1 percent of Management Zone IV, and 85 percent of PPH and PGH are within 4.3 miles of cropland (Manier et al. 2012).

#### *Baker Population*

The Baker population of GRSG has approximately the same distribution as the area covered by the Baker administrative unit, identified in Oregon's Sage-Grouse Conservation Strategy (Hagen 2011). In 2010 the Baker spring population was estimated to be 872 to 1,650 birds. This is the smallest extant population of GRSG exclusively within Oregon (USFWS 2013a). More than 80 percent of the Baker population's historical habitat remains available today. Nevertheless the Baker population is considered more at risk and likely less resilient due to its small population size and limited connectivity to other populations. These factors, along with invasive weeds and juniper encroachment are considered to be the primary threats to this population (Hagen 2011), but other threats are renewable energy development (primarily wind), energy transmission, and OHV recreation.

#### *Northern Great Basin Population*

The Northern Great Basin population of GRSG is large in Oregon, Idaho, Nevada, and Utah, which contains a large amount of publicly managed land (mostly BLM). This area also includes among the least fragmented and largest sagebrush-dominated landscapes within the extant range of GRSG (Knick and Hanser 2011).

Oregon represents the western part of this large population, which is shared with southern Idaho, northeast Nevada, and northwest Utah. Within Oregon, this represents one of the largest populations. The delineation of the Northern Great Basin population does not correspond well to any existing assessment for Oregon, but it does include almost all of the Vale administrative unit, as well as portions of the Burns administrative unit. In Oregon alone, the spring population in the Northern Great Basin is likely to be several thousand birds, with spring lek counts approaching 3,000 males.

Loss of sagebrush habitat has been and continues to be the major threat to the population in Oregon. Historically this loss of sagebrush habitat occurred through deliberate mechanical and chemical treatment of sagebrush to increase livestock forage. Between 1963 and 1974 over 500,000 acres of sagebrush was deliberately seeded with crested wheatgrass or sprayed with herbicide (Garton et al. 2011). More recently wildfire has become the most significant threat to landscape-scale losses of sagebrush habitat. In conjunction with fire, invasive

annual plants are also one of the greatest risks to the over 4 million acres of sagebrush habitat for this population in Oregon. More than 580,000 acres are already dominated by invasive plant species (Hagen 2011).

Other threats in this region are mining, renewable energy development and transmission, and due to its greater abundance in higher elevations, juniper encroachment.

*Relevant Cumulative Actions*

There are two potential gold mining operations covering up to 1,050 acres that would impact GRSG habitat in Management Zone IV. The construction of the mines and associated roadways would reduce and further fragment GRSG habitat in this region. Furthermore, increased noise and air pollution could disturb GRSG during their breeding season or other sensitive periods.

The Boardman to Hemingway transmission line project will connect electrical energy transmission from Boardman, Oregon, on the Columbia River to the Hemingway substation in Melba, Idaho. This project would impact Morrow, Union, and Malheur Counties in Oregon and Owyhee and Canyon Counties in Idaho. Activities associated with the construction of the Boardman to Hemingway project could include short-term surface disturbances and increases in noise, which could affect GRSG fitness and reproductive success. In the long term, the operation of the Boardman to Hemingway project would likely increase the potential for habitat fragmentation and predation on GRSG.

A number of projects for invasive plant control, vegetation restoration, conifer removal, and fuels treatment are ongoing and would reduce GRSG habitat in the short term. Ultimately, these habitat restoration projects are expected to enhance conditions and expand habitat acreage for GRSG.

There are a number of Candidate Conservation Agreements (CCAs) and Candidate Conservation Agreements with Assurances (CCAAs) in Oregon. Though none have been implemented, assuming they are signed, these are voluntary agreements whereby landowners agree to manage their lands to remove or reduce threats to GRSG. In CCAAs, landowners receive assurances against additional regulatory requirements should GRSG ever be listed under the ESA. These agreements are expected to enhance conditions for GRSG and improve habitat connectivity.

The ODFW is implementing WAFWA's sage-grouse strategy across management zones. The WAFWA sage-grouse strategy includes monitoring, research, outreach, and funding of conservation projects for sage-grouse. A basic premise of the WAFWA sage-grouse strategy to ensure sage-grouse conservation is that additional conservation capacity must be developed at all government levels range-wide for both the short term (first three to five years) and for the long term.

The US Department of Agriculture, Natural Resources Conservation Service (NRCS)'s Sage-Grouse Initiative includes private landowners in 11 western states to improve habitat for GRSG, while improving working ranches (Natural Resources Conservation Service 2012). With approximately 31 percent of all sagebrush habitat across the range in private ownership (Stiver 2011), a unique opportunity exists for the NRCS to benefit GRSG; it can ensure the persistence of large and intact rangelands by implementing the Sage-Grouse Initiative (USFWS 2010a).

Participation in the NRCS Sage-Grouse Initiative program is voluntary, but willing participants enter into binding contracts or easements to ensure that conservation practices that enhance GRSG habitat are implemented (USFWS 2010a). Though participation is voluntary and, thus, not a traditional regulatory approach, participating landowners are bound by contract. Usually three to five years in duration, the contracts require landowners to implement conservation practices in consultation with NRCS staff in order to receive financial incentives. This generally takes the form of payments to offset costs of implementing conservation practices and easement or rental payments for long-term conservation (USFWS 2010a).

While potentially effective at conserving GRSG populations and habitat on private lands, incentive-based conservation programs that fund the Sage-Grouse Initiative generally require reauthorization from Congress under subsequent Farm Bills; therefore, these funding streams are potentially variable as they are subject to the political process.

As of 2012, the Sage-Grouse Initiative has secured conservation easements on 208,000 acres across the GRSG range (NRCS 2012), the largest percentage of which is in Wyoming (120,700 acres).

The ODFW is also implementing the state GRSG plan adopted in April 2011 (ODFW 2011); its provisions are included in this RMPA as Alternative E. Alternative E uses habitat designations of Low Density habitat instead of PGMA and Core Area habitat rather than PPMA. Management of core habitat would be similar to PPMA, but Low Density habitat covers fewer acres of BLM-administered land than PGMA. Despite this, it would still protect areas outside of PGMA. The ODFW plan would provide recommendations for lands not administered by the BLM. Implementation of Alternative E would restrict mineral leasing, ROW siting, OHV use, and other activities in GRSG habitat on BLM-administered lands. If recommendations were adopted on lands not administered by the BLM, these restrictions and protections for GRSG would cover a larger area.

*Major Threat: Fire*

Wildfire has been a primary threat to GRSG habitats and populations occurring across Management Zone IV, resulting in habitat loss and fragmentation (USFWS 2013a). From 2001 to 2011, more than 3.8 million acres (10 percent of PPH and

13 percent of PGH) of GRSG habitats have burned in this management zone. Nearly 800,000 acres of GRSG habitat burned during two fires in 2012 alone. An average of more than 237,000 acres of PPH burns annually, with more than a million acres burned in some years. The Murphy Fire in Idaho and Nevada affected over 650,000 acres of habitat in this management zone in 2007 (USFWS 2013a). Additionally, 81 percent of the region is considered at high risk for fire. Approximately 8.5 million acres (26 percent) spread throughout Management Zone IV is also considered high risk for cheatgrass invasion. Both the Baker and Northern Great Basin GRSG population areas are at high risk of fire.

Under current management (Alternative A), prescribed burning may be used to achieve habitat objectives. Alternative A lacks clear desired conditions allowing for disparate interpretations to guide use of fire and fuels management. Alternatives B, C, D, E, and F all prioritize sagebrush protection in fuels treatment programs and provide for protection and maintenance of sagebrush habitat in the event of wildfire, with Alternative D providing the most specific direction and the widest range of allowable techniques for fire control. Alternative E would also allow for treating sagebrush to create mosaics, but its approach is more limited than under Alternative D.

GRSG populations within Management Zone IV have some of the highest densities of all of the seven WAFWA management zones; however, they have undergone long-term population declines. Under Alternative A, the direct and indirect effects of wildfire described in Chapter 4 would likely continue to increase loss and fragmentation of sagebrush habitat in this management zone. This would be in conjunction with the likelihood of increasing future fires from annual weed invasions and predicted climate change. Some of the listed past, present, and reasonably foreseeable future actions that may help alleviate impacts from fire are ongoing vegetation management actions that reduce fuels, control noxious weeds, and improve wildlife habitat. Examples of these activities are the Baker Habitat Restoration and Fuels Treatment (45,000 acres) and the Mormon Basin Fuels Treatment.

An additional factor in the analysis of cumulative effects of fire on GRSG is the trend of increasing fire size, frequency, and severity, due to such factors as exotic annual grasses, human disturbances, or climate change. The management actions under Alternative B and the other action alternatives for fire seek to minimize the impacts from wildfire on GRSG habitat.

Management actions under Alternative B and the other action alternatives with regard to fire are focused on increased protection of GRSG habitat, primarily within PPMA/Core Area habitat, by limiting loss or fragmentation, with additional emphasis on protecting sagebrush habitat during suppression and prevention planning and staging. Therefore, the direct and indirect effects of fire on GRSG from the management actions under Alternative B may be reduced. The past, present, and reasonably foreseeable future actions do not substantially

increase impacts on GRSG from wildfire. Alternatives C and F have substantially the same approach as Alternative B for wildfire, though Alternative C's emphasis on grazing removal and passive restoration could result in increased spread of invasive weeds, such as cheatgrass, which promote fire risk and may alter fire regime (Balch et al. 2012).

Alternatives D and E for fire are more proactive than Alternatives B, C, and F, and allow a wider range of permitted activities to reduce fire risk. While these activities, including prescribed burns, could cause short-term reductions in GRSG habitat, over the long term these approaches would be more likely to reduce loss of habitat on public and private lands from wildfire. However, VDDT modeling of vegetation cover under the alternatives (**Tables 4-2 and 4-3**) indicates the increase in fuels treatment under Alternative D and the sagebrush treatments under Alternative E would be insufficient to halt or reverse current projected declines in sagebrush cover.

The cumulative effect of the direct and indirect effects of management actions under the action alternatives, when combined with the past, present and reasonably foreseeable future actions, are similar to the cumulative effects described in Alternative B. They are not expected to change the existing population trends or remove and fragment sagebrush habitat past a critical threshold.

#### *Major Threat: Spread of Weeds*

Invasive weeds alter plant community structure and composition, productivity, nutrient cycling, and hydrology. Weeds may cause declines in native plant populations, including sagebrush habitat, through competitive exclusion and niche displacement, among other mechanisms. Invasive plants reduce and, in cases where monocultures occur, eliminate vegetation that GRSG use for food and cover. Invasive plant species do not provide suitable GRSG habitat, since the species depends on a variety of native forbs and the insects associated with them for chick survival.

GRSG also depend on sagebrush, which they eat year-round and use exclusively throughout the winter for food and cover. Along with replacing vegetation essential to GRSG, invasive plant species fragment GRSG habitat or reduce habitat quality. Invasive plant species can also create long-term changes in ecosystem processes, such as fire cycles and other disturbance regimes that persist even after an invasive plant is removed (Connelly et al. 2004). All the GRSG subpopulations in Oregon are threatened to some extent by spread of invasive weeds, especially invasive annual weeds.

Under current management (Alternative A), the BLM uses integrated weed management techniques. These include mechanical, manual, chemical, and biological control to reduce the likelihood of invasive weed spread and the extent of current infestations. This issue is intimately tied to the threat from fire, and fuels management actions can also reduce weeds and create fire breaks.

Both the Baker and Northern Great Basin GRSG population areas are at high risk from the spread of weeds.

Under all alternatives, integrated vegetation management would continue to be used to control, suppress, and eradicate noxious and invasive species. Under the action alternatives, vegetation management and restoration would prioritize sagebrush reestablishment and weed control as part of habitat management.

Furthermore, the restrictions on uses that would be implemented under the action alternatives would reduce surface-disturbing activities, thereby reducing the likelihood for the introduction and spread of weeds. Alternative C would also restrict livestock grazing, which would further restrict the spread of invasive weeds via livestock. However, it could also impact weed control agreements with lessees, which would reduce the resources available to combat weed spread on BLM lands.

To the extent that the BLM reduces human disturbance from road building, ROW construction, and livestock grazing in habitat areas under the action alternatives, these actions would likely reduce the spread of weeds into new areas. Alternatives B and C are most restrictive of new roads and infrastructure projects on BLM-administered lands. State and local plans to restore habitat would also benefit GRSG populations. Overall, methods, approaches, and resources for weed control would be similar under all alternatives. As a result, the action alternatives would not substantially increase cumulative effects on GRSG from the spread of weeds.

*Major Threat: Isolation/Small Population Size*

The Northern Great Basin as a whole represents one of the larger areas of habitat connectivity and supports the largest GRSG population (Garton et al. 2011). However, the Baker population is small (estimated to be 872 to 1,650 birds in 2010), lacks nearby suitable habitat, and likely has limited connectivity to nearby populations due to habitat and topography (USFWS 2013a). However, there is recent evidence of some connectivity between the Baker population and the Weiser population in Idaho. These areas have been isolated by extirpation of neighboring populations or conversion of sagebrush habitat to agricultural fields or human developments. Isolation and small population size is a major threat to the Baker population of GRSG in Oregon.

Special designations, such as ACECs and WSAs, would protect GRSG habitats. This is because they include special management prescriptions, often restrictions on resource uses, to protect areas from habitat fragmentation, loss, and human disturbance. In ACECs where GRSG is a relevant and important value, management prescriptions would be tailored to the threats to GRSG in the specific location. These prescriptions would be more likely to protect intact GRSG habitats or populations. In ACECs designated to protect other values, where the management prescriptions would not be intended to protect GRSG, some incidental protection may also be provided to GRSG by actions designed



to protect other relevant and important values. In addition, other BLM protective actions, such as fire suppression, BLM-administrative lands retention, and ROW co-locating, would provide additional benefit to isolated populations that can least afford to lose individuals or reduce recruitment rates.

Across all alternatives, state and local efforts would continue to address the isolation and small population threat through a mix of voluntary and regulatory mechanisms. In addition, many of the proposed projects listed in **Table 5-1**, including habitat restoration projects and vegetation and wildfire treatments, would contribute to alleviating isolation and fragmentation. They would accomplish this by increasing the extent and connectivity of habitats and by preventing fires that would fragment habitats.

Overall, action Alternatives C and F would be more protective of isolated GRSG populations by designating over 4 million acres of new ACECs to protect GRSG. Existing ACECs would continue to be managed under Alternatives A, B, D, or E but would not be explicitly managed to protect GRSG. However, other management actions in all the action alternatives, such as those for fire and land tenure, would likely prevent the threat of isolation and small population size from worsening. This would be the case when the management actions are combined with the proposed restoration and vegetation management projects shown in **Table 5-1**.

#### ***Management Zone V***

Management Zone V contains the westernmost extent of GRSG distribution. Population stability within the management zone is highly mixed. Some of the areas are undergoing range contraction as populations on the edges are becoming extirpated, and other areas have been highly stable.

This management zone consists of five populations/subpopulations in three states (Connelly et al. 2004). The Klamath, Central Oregon, and Western Great Basin populations are found partially or completely within Oregon. These three GRSG populations represent the westernmost extent of the GRSG range, and a mix of habitat issues here have had long-term effects on GRSG. Most of the sagebrush landscape (77 percent) is federally managed (Knick 2011), suggesting that federal habitat management may have a strong influence on these populations. GRSG leks in Management Zone V are relatively well connected (second to the Wyoming Basin; Knick and Hanser 2011); however, the COT Report (USFWS 2013a) identifies habitat loss and fragmentation due to wildfire, invasive weed spread, and conifer encroachment as primary threats to GRSG in this area (USFWS 2013a). However, wildfire is generally less of a threat in MZ V compared to MZ IV because the number of fires and average fire size is smaller in the Oregon portion of MZ V than MZ IV.

The range of GRSG in the sub-region has continued to shrink over the last three decades, although some populations within Management Zone V remain relatively stable. When considered in its entirety, including south-central

Oregon, population change from 1965 to 2004 was statistically undetectable (Connelly et al. 2004); depending on the estimates, it declined by 2 to 3.3 percent (Garton et al. 2011; WAFWA 2008). Of the seven management zones, Management Zone V is one of those supporting the highest densities of GRSG.

#### *Central Oregon*

The central Oregon population has approximately the same distribution as the area covered by the Prineville administrative unit identified in Oregon's Sage-Grouse Conservation Strategy (ODFW 2011). Approximately 700,000 acres of habitat for the central Oregon population has been identified as priority areas for conservation. This is a relatively large population, with the minimum spring population estimated at 1,775 to 2,084 birds in 2010 (Hagen 2011).

This population is estimated to have only 53 percent of historic sagebrush habitat, having lost more than any in other GRSG administrative unit in Oregon. The area also has a high proportion of privately owned GRSG habitat (48 percent), compared with most other GRSG management zone populations in Oregon.

This population faces a wide suite of threats, including juniper encroachment, (Freese 2009). This threatens over 900,000 acres of the 1.8 million acres of sagebrush habitat in in this area. It also threatens connectivity with other Oregon populations to the south and east (Hagen 2011).

Additional threats are invasive annual weeds, fire, mining, and grazing. Projections based on historic trends suggest this population is at risk; however, in the last two years there have been a number of positive developments, including thousands of acres of habitat improvement under the NRCS's Sage-Grouse Initiative (NRCS 2012) and increasing local interest in GRSG conservation.

#### *Western Great Basin*

The Western Great Basin GRSG population is shared among southeastern Oregon, northeastern California, and northwestern Nevada. Range-wide for GRSG, this area contains one of four remaining large intact expanses of sagebrush habitat and connects south-central Oregon with northwest Nevada. Most of the sagebrush-dominated landscape is in Oregon (Knick and Hanser 2011). Habitat fragmentation increases to the south and west in the population. Garton et al. (2011) estimated for the Western Great Basin a minimum population estimate of 5,904 males in 2007 (includes northeast California and northwest Nevada). The Western Great Basin is the most resilient population in Management Zone V, but reducing threats is not likely to ensure long-term persistence in some areas. Resiliency needs to be improved in the California and Nevada portions of the Western Great Basin, with increased habitat suitability in terms of shrub densities and native grasses and forbs.

Oregon's portion of the population has some of the best habitat and highest GRSG densities in the state. It includes Hart Mountain National Antelope Refuge and Trout Creek Mountains, though habitat in the latter was likely compromised by 2012 fires. The delineation of the Western Great Basin population does not correspond well to any existing assessment for Oregon; however, it includes almost all of the Lakeview administrative unit, as well as portions of the Burns and Vale administrative units.

In Oregon, the spring population in the Western Great Basin likely exceeded 10,000 birds in 2010 (Hagen 2011). Over 80 percent of the Oregon historic GRSG habitat remains intact, and most of the habitat is in public ownership (Hagen 2011). In the Lakeview administration unit, which comprises most of the Western Great Basin population in Oregon, about 78 percent of the region is administered by the BLM; the USFWS manages more than 278,000 acres. Invasive weeds, fire, and juniper encroachment (particularly on the western edge) represent the greatest risks to this population. Renewable energy development (wind and geothermal) and wild horses have also been identified as threats to GRSG habitat in the Steens and Dry Valley/Jack Mountain action areas.

#### *Relevant Cumulative Actions*

Two ROWs for transmission line construction and expansion are proposed that would affect the central Oregon and the Western Great Basin population areas. Both of these population areas also have proposed wind energy projects, which would impact GRSG habitat. There are 37 grazing permit renewals that could affect GRSG in the Western Great Basin population area. The proposed expansion of the Tucker Hill Perlite Mine from 23 acres to 75 acres would affect the central Oregon population area.

A number of noxious weed control, vegetation restoration, conifer removal, and fuels treatment projects are ongoing and would reduce GRSG habitat in the short term. Ultimately, these habitat restoration projects are expected to enhance conditions and expand habitat acreage for GRSG.

#### *Major Threat: Fire*

Fire has largely negative effects on GRSG by directly affecting the distribution and condition of available sagebrush habitats (Beck et al. 2009; Baker 2011). Wildfire and prescribed fires typically kill sagebrush, thereby reducing cover and forage in the short term.

However, fire is also beneficial to many sagebrush ecosystems and does not always have net negative effects on GRSG populations and habitats. In some higher elevation habitats, where mountain big sagebrush is the dominant canopy, rapid regeneration due to site potential, seed production and layering can produce 25 percent cover within 20 years (Winward 2004).

There is little evidence that fire will enhance GRSG habitat in Wyoming big sagebrush communities (Crawford et al. 2004). In low elevations, wildfire represents an important threat to habitat conservation and population stability (USFWS 2010a). This is due to increased fuel potentials caused by annual grasses and landscape-scale decrease in intact sagebrush habitats. Within Oregon's Management Zone V, the effects and extent of habitat conversion from wildfire are variable, but the increased fire susceptibility is associated with increased invasion of nonnative annual grasses.

Current wildfire suppression and fuels management would continue under Alternative A. Alternative A lacks clear desired conditions allowing for disparate interpretations to guide use of fire and fuels management. The direct and indirect effects described in Chapter 4 may result in the increased loss and fragmentation of the existing sagebrush habitat from wildfire. This would be in conjunction with past, present, and reasonably foreseeable actions and the likelihood of increasing fires from invasive annual grasses.

Some of the ongoing activities that may help alleviate impacts from fire are ongoing vegetation management actions that control noxious weeds and post-fire rehabilitation, such as the Prineville, Burns, Lakeview, and Vale District-wide Herbicide EAs and the Brown's Valley Paisley Desert Fuel Break Mowing (770 acres).

Management actions for fire under Alternative B and the other action alternatives are focused on increased protection of GRSG habitat, primarily within PPMA/Core Area habitat, benefitting GRSG by limiting habitat loss or fragmentation. Alternatives B, C, D, E, and F all prioritize sagebrush protection in fuels treatment programs and provide for similar protection and maintenance of sagebrush habitat in implementing prescribed burning the event of wildfire, with Alternative D providing the most specific direction and the widest range of allowable techniques for fire control. Alternative E would also allow for treating sagebrush to create mosaics, but its approach is generally more limited than under Alternative D. VDDT modeling of vegetation cover under the alternatives (**Tables 4-2 and 4-3**) indicates the increase in fuels treatment under Alternative D would not halt or reverse the current projected declines in sagebrush cover.

An additional factor in the analysis of cumulative effects of fire on GRSG is the trend of increasing fire size, frequency, and severity in rangelands, from such factors as incursion of exotic annual grasses and human disturbances.

The cumulative effect of the direct and indirect effects of management actions for fire under Alternatives C, D, E, or F, when combined with the past, present, and reasonably foreseeable actions, are similar to Alternative B. When combined with the past, present, and reasonably foreseeable actions, these fire management actions do not substantially increase impacts on GRSG. They are not expected to be substantial, to change the existing population trend, or to remove and fragment sagebrush habitat past a critical threshold.

*Major Threat: Spread of Weeds*

Invasive weeds alter plant community structure and composition, productivity, nutrient cycling, and hydrology. They may cause declines in native plant populations, including sagebrush habitat, through competitive exclusion and niche displacement, among other mechanisms. Invasive plants reduce and, in cases where monocultures occur, eliminate vegetation that GRSG use for food and cover. Invasive plant species do not provide suitable habitat, since GRSG depend on a variety of native forbs and the insects associated with them for chick survival.

GRSG also depend on sagebrush, which they eat year-round and use exclusively throughout the winter for food and cover. Along with competitively excluding vegetation essential to GRSG, invasive plant species fragment GRSG habitat and reduce habitat quality. Invasive plant species can also create long-term changes in ecosystem processes, such as fire cycles and other disturbance regimes that persist even after an invasive plant is removed (Connelly et al. 2004). All the subpopulations in the Great Basin sub-region are threatened to some extent by spread of invasive weeds, especially cheatgrass.

All three populations within Management Zone V are threatened by widespread weeds and annual grasses (USFWS 2013a). About 77 percent of lands within this management zone are under federal management. Since 2000, more than 1.5 million acres have burned. Most of the management zone is considered at high risk of fire, and about 44 percent of lands are considered to be at high risk of cheatgrass. Approximately 8 percent of PPH and 4 percent of PGH do not meet BLM land health standards in this management zone (Manier et al. 2013).

Most PGH and all PPH occur on BLM-administered lands. Management Zone V has approximately the same amount of lands in PPH and PGH as Management Zone IV; however, Management Zone V has a much greater percentage of its land in PPH and PGH, potentially providing much greater opportunities for restoration and for reducing the potential for invasive species via federal actions.

Under the action alternatives, vegetation management and restoration would prioritize sagebrush reestablishment and weed control as part of habitat management.

Under all alternatives, integrated vegetation management would be used to control, suppress, and eradicate noxious and invasive species. This management would use mechanical, manual, chemical, and biological control to reduce the likelihood of invasive weed spread and the extent of current infestations. This issue is intimately tied to the threat from fire, and fuels management actions can also reduce weeds and create fire breaks. Although this increased management focus could benefit GRSG habitat, the actual change in the probability of invasive weed establishment would depend on the resources available to devote to the effort. Weed treatment and removal projects that would benefit GRSG habitat

in the long term are ongoing or planned throughout Management Zones IV and V (see **Table 5-1**).

To the extent that the BLM reduces human disturbance from road building, ROW construction, and livestock grazing in habitat areas under the action alternatives, these actions would likely reduce the spread of weeds into new areas. Alternatives B and C are most restrictive of new roads and infrastructure projects on BLM-administered lands. State and local plans to restore habitat would also benefit GRSG populations.

Alternative C would also restrict livestock grazing, which would further restrict the spread of invasive weeds via livestock. However, it could also impact weed control agreements with lessees, which would reduce the resources available to combat weed spread on BLM lands. Overall, methods, approaches, and resources for weed control would be similar under all alternatives.

*Major Threat: Conifer Encroachment*

Expansion of conifer woodlands, especially juniper (*Juniperus* spp.), presents a threat to GRSG because this vegetation does not provide suitable habitat for the species. Furthermore, mature trees displace shrubs, grasses, and forbs, which are important components of GRSG habitat, through direct competition for resources. Juniper expansion is associated with increased bare ground and potential for erosion (Petersen et al. 2009). Mature trees may offer perch sites for raptors, so woodland expansion may also represent expansion of raptor predation threat.

In Management Zones III, IV, V, and VI conifer encroachment is connected to reduced habitat quality in important seasonal ranges, where woodland development is sufficient to restrict shrub and herbaceous production (Connelly et al. 2004). While widespread, this problem affects specific sagebrush habitats and GRSG populations because of local juniper and pinyon-juniper expansions. Notably, Forest Service research indicates that more than 55 percent of Great Basin sagebrush ecosystems (Management Zones III and V) are at risk of cheatgrass invasion; approximately 40 percent of this same landscape was at risk of displacement by juniper expansion. Within Management Zone V in Oregon, all three GRSG population areas have significant juniper encroachment, increasing isolation and extirpating some populations on the western edge of the range.

Conifers would be removed under all alternatives and would continue to improve GRSG habitat. It would do this by increasing forage, cover quality, and composition and by reducing predator perches, decreasing fire spread and intensity, and potentially increasing water availability within Management Zones IV and V. Most alternatives specify areas where vegetation treatments would be prioritized and how treatments would be developed. However, treatment acres are not specified within the alternatives and therefore are not quantifiable by alternative.

Under Alternative A, management would continue to use GRSG habitat standards, defined by Connelly et al. (2000a) and Hagen et al. (2007), though there is little direct guidance to manage for conifer encroachment. Vegetation treatments for GRSG would continue to be prioritized in population areas and would follow the associated conservation strategy. Treatments would also be prioritized within proximity to active lek sites and within early-stage juniper stands. The BLM and Forest Service would continue to coordinate vegetation treatments with other federal and state agencies, private landowners, and tribes.

Some of the ongoing activities that may help alleviate impacts from conifer encroachment are ongoing vegetation management actions that cut or burn juniper and lodgepole pine, such as the High Desert Shrub Steppe EA (10,000 acres/year), the Playa EA (2,000 acres/year), and the South Warner Sagebrush Sage-Grouse Habitat Restoration (50,000 acres).

For conifer expansion, Alternatives A, B, D, and F provide very similar guidance. Management under Alternatives B, D, E, and F would prioritize vegetation treatments within PPMA/Core Area habitat and PGMA/Low Density habitat. Alternative D would have the greatest likelihood to increase acres restored, because it provides specific on-the-ground management objectives for vegetation treatments, which are categorized by GRSG seasonal habitat requirements. Alternatives B, D, and F explicitly require the establishment of designated seed harvest areas for sagebrush seed collection in fire-prone areas. In addition, post-restoration management plans would be implemented to ensure long-term persistence of vegetation treatments. Alternative E would cover less BLM-administered land than the other action alternatives because Low Density habitat encompasses a smaller area than PGH. Alternative E also places strict limits on juniper removal, potentially leading to more loss of GRSG habitat.

Management under Alternative C would focus vegetation treatments in unoccupied GRSG habitats (e.g., crested wheatgrass seeding, urban interface, and areas of significant disturbances). Because this alternative focuses on passive restoration, it does not provide for increasing the amount and quality of GRSG habitat as much as the other action alternatives. Whether these alternatives' actions would treat conifer expansion at an adequate rate to maintain existing GRSG habitat and avoid fragmentation and increased predation will depend on funding.

#### *Conclusion*

Some populations will be affected more than others because they are smaller or already at higher risk. Under any alternative, despite BLM, state, and local actions, overall trends toward habitat loss are likely to continue in the small and isolated Baker population due to wildfire, disease, and predation in GRSG habitat. The central Oregon, Western Great Basin, and Northern Great Basin populations are large and presently stable; however, they face threats from a

variety of human developments and infrastructure, in addition to the major threats outlined above. These populations are potentially at risk over the long term without effective vegetation management and land development restrictions.

Under Alternative A, current management would continue on BLM-administered lands. While current approaches to vegetation management and fire suppression are benefitting GRSG, there is little specific guidance toward amelioration of major threats to GRSG in Management Zones IV and V. There would be limited interim protections within GRSG PPH or PGH, no new ROW avoidance or exclusion areas would be established, and there would no new areas closed or restricted to other resource uses.

Current management does consider wildlife habitat value in decision making, which provides limited protection for GRSG. Existing ACECs (less than 500,000 acres) would be maintained that could protect some portions of GRSG habitat.

Current sagebrush protection and habitat restoration would continue in order to improve rangeland and establish or improve connectivity between habitat areas. However, planned transmission lines and ROWs across federal, state, and private land would likely increase fragmentation of GRSG habitat. Voluntary protections would continue to be implemented on private land (i.e., NRCS Sage-Grouse Initiative, CCAs, and CCAAs).

Overall, the limited number and extent of regulatory mechanisms under Alternative A would continue to degrade habitat, resulting from the major threats in Management Zone IV and V.

Guidance provided under the action alternatives would reduce major threats faced by GRSG in Management Zones IV and V to some extent. Nevertheless, VDDT forecasting shows that overall trends toward habitat loss and fragmentation are likely to continue from the spread of invasive weeds, isolation, wildfire, and conifer encroachment. The BLM has limited ability to manage these threats through implementation of regulatory mechanisms. BLM management under the alternatives can restrict resource uses and development, which also pose threats in GRSG habitat; however, the major threats (invasive weeds, wildfire, and conifer encroachment) can be limited only by vegetation management. These programs are limited to certain areas and is unlikely to approach the scope of the threats or to prevent catastrophes such as large-scale wildfire. Thus, the major threats are likely to continue in Management Zones IV and V under all alternatives.

Under Alternative B, the BLM would implement a number of protections for GRSG, including designating PPMA and PGMA and managing new ROW exclusion and avoidance areas. Habitat would be protected by various use restrictions, including closure to mineral exploration and development. Existing ACECs would be maintained, but no new ACECs would be established. Land



disposals and acquisitions would focus on maintaining sagebrush acreage and connectivity.

Habitat-restoration projects would be prioritized in areas most likely to benefit GRSG populations. Under Alternative B, the BLM would site transmission lines in locations that minimize impacts on GRSG, likely reducing the acres of habitat disturbed, compared to Alternative A. These restrictions may dissuade developers from siting projects on BLM-administered lands. They also may push development onto state or private lands with less ability to properly implement development that minimizes impacts on GRSG. Success on a cumulative scale would be achievable if voluntary programs, local working groups, and state plans are consistently implemented and enforced.

Under Alternative C, management actions would provide more protection to GRSG on BLM-administered land in Management Zone IV and V than any other alternative. Management would be similar to that described for Alternative B but would be applied to all occupied habitat. As a result, strong restrictions in Alternative C may push development onto private or state lands with less stringent protections for GRSG. For example, under Alternative C, ROW exclusion areas would be established on all PPMA administered by the BLM, and all BLM-administered lands would be closed to livestock grazing. This would dramatically reduce the amount of resource uses allowed within GRSG habitat on BLM-administered lands. These policies would provide the most protection for GRSG habitat on BLM-administered land, but the absence of grazing may also result in fine fuel buildup leading to more destructive fires. In addition, the restrictions on BLM-administered land could result in increased habitat conversion or loss on state or private lands, absent additional actions on private lands to reduce threats to GRSG. As a result, management actions under Alternative C could be ineffective in protecting GRSG habitat from loss and fragmentation.

Management under Alternative D would improve GRSG habitat protection over current management but with fewer restrictions than Alternatives B or C. For example, under Alternative D the BLM would manage more areas as ROW avoidance. It would rely on NSO stipulations, instead of more restrictive ROW exclusion areas and closure to mineral leasing. These provisions would allow for limited development on BLM-administered lands, which could reduce pressures on state and private lands that may be protected by only voluntary agreements.

On a cumulative scale, management under Alternative D provides a more balanced approach to ameliorating major threats in Management Zone IV and V across all land statuses. If allowing limited development within GRSG habitat on BLM-administered lands would alleviate development pressures on other lands with less stringent protections, management under Alternative D would have the greatest ability to reduce major threats to GRSG.

Management under Alternative E would be similar to Alternative B in many respects, though it would impose fewer restrictions on ROW development or mineral leasing. As a result, impacts from such development would continue, but cumulative impacts from other threats would be reduced, relative to Alternative A.

Cumulative impacts under Alternative F are similar to those described for Alternatives B and C. However, the BLM would reduce grazing under Alternative F and would establish some ACECs, though on fewer acres than Alternative C. As a result, cumulative impacts under Alternative F would be similar to those described for Alternatives B and C.

#### **5.1.4 Vegetation**

The cumulative impact analysis area used to analyze cumulative impacts on vegetation covers the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect vegetation are vegetation and habitat management and improvement projects, noxious weed control, wildland fire management, livestock grazing management, wild horse and burro use and gathers, mining, and renewable energy development.

##### **Alternative A**

Current management would continue on BLM-administered lands in the planning area. There would be no PPMA or PGMA designated. Most land use plans, particularly the older plans for Brothers-La Pine, Three Rivers, and Baker, would not implement use restrictions (e.g., ROW exclusion and closure to mineral leasing and development) to protect GRSG habitat. Grazing management would not specifically consider GRSG habitat needs, and vegetation management would not prioritize sagebrush. Newer plans (e.g., Southeast Oregon, Lakeview, Steens, Andrews, and Upper Deschutes) may prescribe guidance for some of these resources and uses, but with no or little consistency across the decision area.

Planned ROW construction could increase fragmentation of vegetation, and new oil and gas developments would increase loss of sagebrush vegetation. However, some use restrictions would be implemented, which would protect vegetation in these areas from degradation or removal. Vegetation management and noxious weed control projects would benefit sagebrush ecosystems by removing invasive plants and promoting healthy vegetation communities. Overall, Alternative A would lack the landscape-level management tools to reduce cumulative effects from past, present, and reasonably foreseeable future actions.

**Alternative B**

Under Alternative B, PPMA and PGMA would be designated and use restrictions would be implemented in these areas. For example, ROW exclusion and avoidance areas would be established within PPMA and PGMA, respectively, and these would cover larger areas than under Alternative A. Grazing management would be changed to reduce impacts on sagebrush vegetation. No ACECs would be established.

Most ROWs, access roads, and associated infrastructure planned according to **Table 5-1** would be sited outside PPMA under Alternative B. The exception would be locatable minerals proposed for withdrawal, planned mineral and geothermal exploration and development sited outside PPMA in unleased areas, and conservation measures applied to valid existing rights.

The vegetation management and restoration projects mentioned above would benefit the planning area in discrete locations. As a result, the cumulative effects from past, present, and reasonably foreseeable future actions under Alternative B would be reduced, compared to Alternative A.

**Alternative C**

Removing grazing would likely reduce potential impacts from grazing described in **Section 4.3**, Vegetation. Cumulative impacts associated with grazing would also be reduced. All PPMA would be managed as an ACEC. Use restrictions in these areas would retain the extent and condition of native vegetation, thereby reducing cumulative impacts from resource uses. Other cumulative impacts are similar to those described for Alternative A.

**Alternative D**

Alternative D is intended to preserve management flexibility and provide increased implementation guidance while protecting GRSG habitat. Management under Alternative D would increase vegetation protection compared to current management, but with less protection than Alternatives B or F.

Alternative D would establish ROW avoidance but not exclusion areas, thereby reducing but not eliminating impacts from ROW development. Restrictions on mineral leasing and development would be greater than under Alternative A, but less stringent than Alternatives B, C, and F. Prescribed burning and fuels management would take sagebrush vegetation into account.

As under the other alternatives, the vegetation management and weed control plans listed in **Table 5-1**, Reasonably Foreseeable Future Actions, would benefit vegetation health. Development restrictions in occupied habitat would retain existing vegetation, and rangeland improvements would improve vegetation quality on sagebrush acreage. As a result, the cumulative effects from past, present, and reasonably foreseeable future actions under Alternative D would be reduced, compared to Alternative A, but to a lesser extent than under Alternatives B and C.

**Alternative E**

Cumulative impacts from Alternative E are similar to those described for Alternative D.

**Alternative F**

Alternative F would provide more protection to GRSG habitat on BLM-administered land but would reduce management flexibility. Alternative F would establish ACECs in occupied habitat, and occupied habitat would be ROW exclusion areas and closed to mineral development and leasing. PPMA would be proposed for withdrawal from locatable mineral entry. These provisions would protect vegetation from loss, fragmentation, and disturbance associated with surface-disturbing activities.

Reduced grazing would likely reduce potential impacts from grazing described in **Section 4.3**. Reduced management flexibility could lead to inefficient or ineffective management at the site-specific scale when conditions may require alterations in management. As under the other alternatives, the vegetation management and weed prevention projects listed in **Table 5-1**, Reasonably Foreseeable Future Actions, would benefit vegetation health. Alternative F would impose the most stringent restrictions on development of GRSG habitat, potentially restricting the ROW and mineral developments in **Table 5-1**, thereby retaining the greatest extent of sagebrush vegetation. As a result, Alternative F would result in the greatest reduction in cumulative effects from past, present, and reasonably foreseeable future actions, compared to all alternatives.

**5.1.5 Fish and Wildlife**

The entire planning area was used in the analysis of cumulative impacts on special status wildlife species. Many past and present actions and conditions within the cumulative impact analysis area have affected and will likely continue to affect special status wildlife species, as described in **Section 4.4**, Fish and Wildlife.

There are many habitat improvement projects scheduled for the planning area in the form of noxious weed treatments, conifer encroachment control, wildland fire fuels treatments, and sagebrush habitat restoration. These improvement efforts would expand the extent and increase the quality of habitat for many special status wildlife species. These gains however, could be reduced by impacts from transmission line development, alternative energy projects (wind power and geothermal), livestock grazing, and mining (see **Table 5-1**).

**Alternatives Analysis**

Three indicators were identified to analyze the effects on special status species under each alternative in **Section 4.4**. These indicators include the amount and condition of available habitat, the likelihood of mortality, injury, or direct disturbance, and the likelihood of habitat disturbance.

Management under Alternative A would have the greatest cumulative impacts on special status wildlife species because it provides the fewest considerations of ecological impacts in management decisions. Alternatives B, C, D, and F would designate 4.5 million acres of PPMA and 5.6 million acres of PGMA. This would reduce cumulative impacts on special status wildlife species, compared to Alternative A.

Alternative E would designate 4.5 million acres of Core Area and 3.9 million acres of Low Density habitat. In total, this would provide less protection from cumulative impacts for special status wildlife species, compared to the other action alternatives. Under Alternative C, all occupied habitat would be closed to grazing. This would likely increase fragmentation of special status wildlife habitat as a result of increased fencing. Wildland fire and livestock grazing management under Alternative D would provide comprehensive protection for special status wildlife habitat. However, lands and realty management actions would not be as protective of cumulative impacts, compared to the other alternatives.

Under Alternative D ROW avoidance areas would be established, but no ROW avoidance areas would be included. This would allow for development to continue within PPMA.

Livestock grazing management under Alternative F would close 25 percent of PPMA and PGMA to livestock grazing. This would reduce impacts from grazing on special status wildlife, including the potential for habitat fragmentation from fencing, compared to Alternative C. Therefore, Alternative F would provide the most protection for special status wildlife species that overlap with GRSG habitat. It would result in the fewest cumulative impacts among the action alternatives.

#### **5.1.6 Wild Horses and Burros**

The cumulative impact analysis area used to analyze cumulative impacts on wild horses and burros management includes the planning area. This is because impacts are expected to be limited to those actions originating within the planning area.

Past, present, and reasonably foreseeable actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect wild horses and burros management are actions that change forage and water availability, access to water sources, range conditions, barriers to movement and population control (such as removing excess animals and repressing population).

Reasonably foreseeable projects in the project area include extensive vegetation treatment and fuels reduction projects. These could result in short-term impacts on horses and burros, but they are likely to improve rangeland health in the long term. Population control gathers would continue in the area to keep wild horses and burros at appropriate population levels and to support

maintenance or improvement of land health in the area overall. In addition, actions that indirectly disturb wild horses and burros are recreation and development for transmission, as well as the exploration for energy and mineral development.

Under all alternatives, no direct change would occur to areas allocated as HMAs for wild horses and burros. Under Alternative A, AML would continue to be adjusted as needed, based on rangeland conditions. Populations would be controlled to support land health within the constraints of national priorities and budgets. Under Alternatives B, C, D, and E, there could be long-term reduction of AMLs. This would come about if management for wild horses and burros conflicts with GRSG management objectives, resulting in a cumulative addition to the management needs and associated costs of wild horse and burro management in the planning area. Under Alternative F, a direct 25 percent reduction in AMLs is proposed. This would result in a cumulative addition to costs and time for management of the wild horse and burro program, due to the need for increased gathers. This could strain available resources in the region.

In addition, should management resources be concentrated in GRSG habitat due to priorities for management under the action alternatives, HMAs outside of GRSG habitat may be allotted fewer resources. In general, actions to improve land health for GRSG are also likely to improve rangelands for wild horses and burros, resulting in a cumulative improvement in the ability to meet AMLs.

#### **5.1.7 Wildland Fire Management**

The area used to analyze cumulative impacts on wildland fire management is the planning area.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect wildland fire management are vegetation management, restoration projects, invasive species and noxious weed control, livestock grazing, wildland fire management, lands and realty, recreation, travel management, mining, and energy development. These actions can modify vegetation condition or FRCC, the likelihood of human-caused wildfire, the size, extent, or occurrence of wildfire, or the response to wildland fire.

##### **Alternative A**

Under Alternative A, current management would continue on BLM-administered lands in the planning area. There would be no PPMA or PGMA designated; most land use plans would not implement use restrictions (e.g., ROW exclusion and closure to mineral leasing and development) to protect GRSG habitat. Vegetation, grazing, and wildland fire management would not prioritize sagebrush. Planned ROW construction and new minerals or energy developments could introduce invasive species and remove beneficial vegetation.

Though these projects would provide for fuel breaks, water sources, and fire response access, developments could result in continued risk of human-induced fire and the need for fire response. Planned restoration projects would focus on overall land health and could lead to improved conditions for wildland fire management; however, there is not as much restoration focus as under other alternatives. Overall, Alternative A would result in the highest risk for cumulative contribution to wildland fire from human activities, including recreation, travel, lands and realty, and minerals and energy.

#### **Alternative B**

Under Alternative B, the BLM would manage lands to conserve, enhance, and restore sagebrush ecosystems. Direct protection of sagebrush habitat to support GRSG would limit or modify uses. This would improve the acreage and condition of native vegetation communities, which would retain or improve conditions for wildland fire management within these areas. Use restrictions limiting activities would reduce human-caused fires and damage to native vegetation communities. It would also minimize the spread of invasive species.

Yet, restrictions could also limit wildland fire response and result in higher fuel loads and larger or more intense fires. The vegetation management and restoration projects described in **Table 5-1** would benefit wildland fire management in the planning area in discrete locations. As a result, the cumulative effects from past, present, and reasonably foreseeable actions under Alternative B would be reduced, compared to Alternative A.

#### **Alternative C**

Management under Alternative C would focus on removing livestock grazing and designating ACECs. Designating PPMA and PGMA and restricting mineral and land use would be similar to that described Alternative B. However, there would be fewer acres open to fluid minerals leasing, fewer mineral materials sales, and fewer nonenergy leasables than under Alternative B. Management would focus on removing livestock grazing from GRSG habitats, with other management similar to Alternative A. Planned ROW construction and mineral and energy projects would increase the risk of human-caused fires. Cumulative impacts on wildland fire management from designating PPMA and PGMA and restricting mineral and land use would have the same impacts as described for Alternative B. Other impacts are similar to Alternative A.

#### **Alternative D**

Under Alternative D, the BLM would manage lands to maintain or enhance GRSG habitat to establish a mix of sagebrush classes. Management and impacts are similar to both Alternatives A and B. However, Alternative D would identify focal areas to prioritize restoration projects and coordinate with USFWS and other agencies to prioritize protection of sagebrush habitat. It also would implement a comprehensive approach, with priorities for fuels management, wildfire management, and ES&R within GRSG habitat. The management of land

uses, locatable minerals, and nonenergy leasables would be similar to Alternative A; fluid mineral leasing, mineral material sales, and travel would be the same as Alternative B.

Alternative D would have beneficial impacts on wildland fire management because it would emphasize restoration of native vegetation and fuels treatments as well as prioritize projects for the protection of sagebrush habitat. The planned vegetation management and restoration projects described in **Table 5-1** would further benefit wildland fire management in the planning area. As a result, the cumulative effects from past, present, and reasonably foreseeable actions under Alternative D would be reduced, compared to Alternative A.

#### ***Alternative E***

Conservation guidelines under Alternative E are designed to maintain or enhance the quality of current habitats; however, the overall management and impacts are similar to Alternative B. The greatest difference is the approach to livestock grazing. As a result, the cumulative effects from past, present, and reasonably foreseeable actions under Alternative E would be reduced, compared to Alternative A, but to a lesser extent than Alternative D.

#### ***Alternative F***

Management under Alternative F would be largely similar to that described for Alternative B, though with more stringent guidance and restrictive management in sagebrush ecosystems. More acres would be closed to grazing than under Alternative B. Impacts from Alternative F are similar to those described for Alternative B; however, Alternative F could improve conditions for wildland fire management compared to Alternative B. the cumulative effects from past, present, and reasonably foreseeable actions under Alternative F would be reduced, compared to Alternatives A and B, but to a lesser extent than Alternative D.

### **5.1.8 Livestock Grazing/Range Management**

Past, present, and reasonably foreseeable actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect livestock grazing include those that reduce available grazing acreage or the level of forage production in those areas or that inhibit livestock improvements, such as water development or fences.

In the planning area, relevant past and present actions include human-caused surface disturbances, such as those associated with minerals, transmission and energy development, recreation, and current and historic grazing practices. In addition, changes in habitat due to historic fire suppression and climate change have resulted in junipers and trees encroaching into grasslands, thereby decreasing available forage.



Reasonably foreseeable future actions affecting livestock grazing are similar to present actions. They include ongoing permit and lease renewals and range improvement projects, as detailed in **Table 5-1**. These actions could cumulatively reduce permitted AUMs or restrict management options. This would be the case if allotments were found to be inconsistent with land health standards due to livestock use.

Cumulative projects that increase human disturbance in grazing areas could also indirectly impact grazing by increasing weeds and the spread of invasive species. As stated above, weed invasion can reduce preferred livestock and wildlife forage and can increase the chance of weeds being dispersed by roaming cattle. Cumulative projects that increase human disturbance in grazing areas could also directly impact grazing by displacing, injuring, or killing animals. Such projects include potential access roads, transmission line development, and some minimal geothermal exploration and mineral development.

Conversely, extensive planned vegetation improvement, weed removal, and fuels reduction and restoration in the planning area could exclude grazing from site-specific areas temporarily. However, these activities would generally improve rangeland conditions in the long term by reducing the encroachment of juniper into grasslands and improving vegetation condition. In addition to foreseeable actions, vegetation could change with continued drought or climate change. While difficult to quantify, these changes are likely to include reduced forage availability.

The contribution of the project to cumulative impacts parallels the impacts of the alternatives, as described in **Section 4.7**, Livestock Grazing/Range Management.

#### **Alternative A**

Under Alternative A, permitted active use would likely decline to some extent over time, following observed trends. Alternative A would allow the highest level of surface disturbance of all alternatives. The highest cumulative effect would be decreasing forage availability in the planning area.

#### **Alternative B**

Under Alternative B, while permitted AUMs would not be directly reduced, as compared to Alternative A, permitted active use would decline to a greater extent over time. This would be due to the implementation of grazing management changes to meet GRSG habitat objectives. These objectives include potential grazing management changes and restrictions on structural improvements and water developments. As a result, forage availability may increase in GRSG habitat, although this forage would generally not be available for livestock use. Surface-disturbing activities would be sited in lower priority habitat areas and mainly in nonhabitat areas. This would increase cumulative impacts in these areas.

**Alternative C**

The greatest impacts on livestock grazing in the planning area would be seen in Alternative C, due to the elimination of all AUMs within occupied habitat. The elimination of grazing in occupied habitat could reduce overall livestock grazing, both inside and outside the planning area. Many livestock operations that rely on BLM-administered lands also incorporate private and leased lands in their operations. Private and leased grazing lands are often limited and may not be able to absorb the grazing use that is eliminated from BLM-administered lands.

Elimination of grazing in occupied habitat would likely result in operations going out of business. In other cases, greater reliance on private lands could also put additional pressure on forage resources. It also could accelerate the conversion of private native range at a local level, potentially including GRSG habitat, to agricultural or introduced grass production.

**Alternative D**

Cumulative impacts under Alternative D are similar to those described under Alternative B. However, there would be some increased flexibility for restricting land use. As a result, increasing forage level in GRSG habitat and shifting grazing to non-GRSG habitat may be moderated, along with economic impacts on area permittees.

**Alternative E**

Under Alternative E, management direction would decrease disturbance focused in areas near seasonally important GRSG habitat and leks. As a result, forage in these areas and disturbance in other areas may increase.

**Alternative F**

Under Alternative F, permitted grazing would be reduced. Areas open to grazing would be reduced by approximately 25 percent, and permitted AUMs would be reduced approximately 62.5 percent in GRSG habitat. As discussed for Alternative C, the reduction of grazing in occupied habitat could reduce overall livestock grazing, both inside and outside the planning area. This also may have economic impacts on local permittees and lessees. In addition, prohibiting structural range improvements and new water developments under Alternative F would further decrease grazing for both BLM lands and the area overall. This would increase forage availability but could lead to closures or reductions in grazing should operators go out of business.

**5.1.9 Recreation**

The cumulative impact analysis area used to analyze cumulative impacts on recreation is the planning area and all big game herd units that intersect the planning area. Any activities that affect game populations would in turn impact wildlife viewing and hunting because of the loss or gain of the number of animals. The cumulative impact analysis area also extends along major roads, trails, and rivers, where management inside the planning area could impact use outside of it.

Past, present, and reasonably foreseeable actions and conditions within the cumulative impact analysis area have affected and will likely continue to affect recreation surrounding BLM and Forest Service management plans and increased visitation (especially from residents in the planning area and those from the surrounding region). Actions identified in **Table 5-1** that change recreation settings through development or cause the route network to become more congested will also affect recreation. These actions are usually related to energy development or transmission. Overall, these actions are not expected to influence cumulative impacts because of the large remote character of much of the cumulative impact analysis area.

The proposed Steens Mountain Comprehensive Recreation Plan would improve recreational opportunities and experiences in the Steens Mountain Cooperative Management and Protection Area by maintaining facilities, creating new facilities and trails, closing roads, and providing interpretation. Impacts would only occur in and adjacent to the Steens Mountain Cooperative Management and Protection Area.

#### ***Alternatives Analysis***

Under Alternatives A and C, existing recreation opportunities would be maintained. Fuels treatments and road and trail infrastructure upgrades are expected to benefit recreation by improving the recreational setting and opportunities.

Under Alternative B, limits on road construction in PPMA would reduce new opportunities for motorized recreation in the long term. This could result in localized congestion and user conflicts if motorized travel were to increase in popularity. Eliminating all cross-country motorized travel would result in a cumulative loss of cross-country recreation opportunities. Some users would go elsewhere to seek these opportunities, but there are few lands within the analysis area open to cross-country use.

Under Alternative D, adding stipulations to SRPs to protect GRSG and their habitat could force permittees to move their businesses and events onto lands not administered by the BLM in the planning area. This is not expected to result in a loss of recreation opportunities because organized recreation would be shifted to new locations or times of the year.

Cumulative impacts under Alternative E are similar to those under Alternative D. Conservation measures and relocation requirements for SRPs would result in seasonal and locational shifts in organized recreation, but they are not expected to result in large-scale loss of recreation opportunities.

Impacts under Alternative F are the same as those described under Alternative B.

**5.1.10 Travel Management**

The cumulative impact analysis area used to analyze cumulative impacts on travel management includes the planning area and extends along major roads and trails where management inside the planning area could impact use outside it.

Past, present, and reasonably foreseeable actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect travel management are increased use of the travel system and any new actions that introduce additional traffic or reduce or expand the travel system. Actions identified in **Table 5-1** that would impact travel management are travel system maintenance, energy development, and expansion of the WUI. Overall, these actions are not expected to influence cumulative impacts because of the large remote character in much of the cumulative impact analysis area. Impacts would be localized, occurring in the vicinity of these new actions and near population centers.

**Alternative A**

Under Alternative A, existing travel opportunities would be maintained, and the existing travel network would continue to meet the public's needs.

**Alternative B**

Eliminating all cross-country motorized travel would result in a cumulative loss of cross-country travel opportunities. Some users would go elsewhere for cross-country travel opportunities, but there are few lands within the analysis area open to cross-country use. Other cross-country travel systems may be less capable of accommodating extensive cross-country use; the multijurisdictional travel system encompassing the analysis area may be unable to accommodate demand.

**Alternative C**

Impacts are the same as those under Alternative A.

**Alternative D**

Impacts are the same as those under Alternative B.

**Alternative E**

Restricting motorized use near leks during breeding season (approximately March 1 through July 15) would seasonally limit access in certain parts of the decision area. It could cause travel to be shifted onto private or state lands in the planning area during breeding season.

**Alternative F**

Prohibiting new road construction and road upgrades in occupied GRSG habitat could result in localized congestion and user conflicts if motorized travel were to increase in popularity. This could cause travel to shift onto private or state

lands and the potential for increased impacts on travel management if those travel systems were ill-equipped for an increase in use.

#### **5.1.1.1 Lands and Realty**

The cumulative impact analysis area used to analyze cumulative impacts on lands and realty includes all lands within the planning area boundary.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect lands and realty are land use authorizations. Past authorizations include those for linear features, such as roads, power lines, and the Ruby Natural Gas Pipeline, and site ROW features such as communication towers and wind energy projects. There is expected to be a steady increase in demand for ROWs to accommodate new power, water, and telecommunication lines, wind projects, and communication sites. Major realty actions currently being considered in the sub-region include the Boardman to Hemingway and McNary-John Day 500-kV transmission line projects, other smaller transmission line projects, wind and geothermal energy projects with associated intertie lines, and communication sites. BLM management prescriptions that would limit the BLM's ability to accommodate ROW development would influence the level of cumulative impacts on lands and realty.

National policies to expand renewable energy production could also contribute to direct and indirect long-term cumulative impacts on the lands and realty program and be affected to various degrees by the proposed alternatives. As part of his 2013 Climate Action Plan, President Obama set a new energy goal of 10 new gigawatts of new renewable energy permitted on DOI lands by 2020 (The White House 2013). This is expected to increase the demand for renewable energy ROWs in the planning area. Wind energy potential in the planning area is moderate to high (NREL 2009a), so alternatives that would restrict renewable energy development would have the greatest effect on the number of wind energy ROWs authorized under the lands and realty program.

#### **Alternative A**

Impacts on lands and realty across alternatives depend largely on the number of acres where the BLM would exclude or avoid new ROW development. Under Alternative A, the BLM would continue to authorize ROW development and temporary surface disturbance on a case-by-case basis. There would continue to be 857,600 acres of ROW exclusion areas and 3,445,700 of ROW avoidance areas. As a result, cumulative impacts on lands and realty would occur only as new ROWs are proposed within avoidance areas. Alternative A would not further affect the BLM's ability to accommodate new ROW development.

#### **Alternative B**

BLM management would include increased levels of ROW restrictions, when compared to Alternative A. Designations of areas as avoidance or exclusion would not impact existing ROW authorizations. The restrictions would,

however, impact the BLM's ability to accommodate future ROWs. Alternative B would prohibit ROW development in PPMAs (4,547,000 acres) and avoid new ROWs in PGMAs (5,662,600 acres). A prohibition on ROW development, particularly electrical transmission lines and wind energy developments in PPMAs, would prevent the BLM from accommodating demand for new ROWs in those areas. Potential ROW applicants could seek authorizations in PGMAs, subject to special siting and design conditions, or could choose to develop on land not administered by the BLM within or outside the planning area. This could increase environmental impacts on sensitive lands, increase permitting times, and decrease the overall effectiveness of the infrastructure system (i.e., the power grid, telecommunication system, or roadway network).

Development on adjacent lands could also result in indirect effects on BLM-administered lands (e.g., via increased vehicle traffic or requests for ROW authorizations for transmission lines). ROW development could also be directed to BLM lands outside the planning area, which would increase the workload on the BLM lands and realty programs in those areas, while decreasing workload for offices with lands in the planning area.

#### **Alternative C**

Alternative C would result in the greatest restriction on ROW development by designating PPMAs and PGMAs (10,216,400 acres) as ROW exclusion. ROW restrictions under Alternative C would eliminate the BLM's ability to accommodate new ROWs, including large-scale transmission lines, wind energy projects, and new or expanded communication facilities. Since southeastern Oregon has the greatest wind energy potential in the state (NREL 2009a), exclusion designations would decrease the state's overall wind energy generation capacity.

ROW applicants could seek authorizations on land not administered by the BLM but inside the planning area. This could increase environmental impacts on sensitive lands, increase permitting times, and decrease the overall effectiveness of the infrastructure system (i.e., the power grid, telecommunication system, or roadway network).

Development on adjacent lands could also result in indirect effects on BLM-administered lands (e.g., via increased vehicle traffic or requests for ROW authorizations for transmission lines). ROW development could also be directed to BLM lands outside the planning area. This would increase the workload on the BLM lands and realty programs in those areas, while decreasing workload for offices with lands in the planning area.

#### **Alternative D**

Alternative D would increase the number of acres managed as ROW avoidance in PPMAs by 2,617,900 acres (61 percent), compared to alternative A. Potential ROW applicants could seek authorizations in PPMAs, subject to special siting and design conditions that minimize surface disturbance (e.g. underground

placement), or they could choose to develop in areas outside PPMAs. Accordingly, Alternative D would result in greater impacts on lands and realty than Alternative A, but less than Alternatives B and C.

**Alternative E**

Cumulative impacts under Alternative E are the same as Alternative B for core habitat areas and the same as Alternative A for low-density habitats.

**Alternative F**

Cumulative impacts under Alternative F are the same as Alternative B.

**5.1.12 Fluid Minerals**

The cumulative impact analysis area used to analyze cumulative impacts on fluid minerals is the planning area, which covers 31,756,500 acres.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect fluid minerals are existing and planned fluid mineral development projects on nonfederal mineral estate within the planning area. Reasonably foreseeable development scenarios and mineral potential reports were not completed for this RMPA/EIS. Therefore, all estimates of future activity are based on **Table 5-1** and on the BLM's assessment of fluid mineral trends.

The management actions proposed under this RMPA/EIS would cumulatively impact fluid mineral development through surface use restrictions (e.g., closures and NSO, CSU, and TL stipulations) that ultimately could decrease the amount of fluid mineral development in the planning area during the planning period.

Applying NSO stipulations could create cumulative closure impacts if areas surrounded by NSO buffers are beyond the reach of current drilling technologies. Closures and NSO stipulations would be the most likely management actions being considered in this RMPA/EIS to decrease fluid mineral development in the planning area. This decrease would have cumulative impacts by potentially increasing the need for foreign fuel imports due to a decrease in domestic availability of energy resources.

Additionally, the demand for mineral materials in the planning area may decrease due to reduced construction in the planning area. National policies to expand renewable energy production could also contribute to direct and indirect long-term cumulative impacts on the fluid minerals program and be affected to various degrees by the proposed alternatives.

As part of his 2013 Climate Action Plan, President Obama set a new energy goal of 10 new gigawatts of new renewable energy permitted on DOI lands by 2020 (The White House 2013). This is expected to increase the demand for renewable energy in the planning area. All of eastern Oregon has favorable geothermal resource potential (NREL 2009b). Because of this, alternatives that

would restrict geothermal development could impact the federal government's ability to achieve the renewable energy goal set by President Obama.

Because closures and NSO stipulations would have the greatest impact on fluid mineral development, the cumulative effects of these management actions are discussed below. Managing areas as ROW exclusion or avoidance could also decrease the amount of fluid mineral development in the planning area. This would be due to limitations on access to both federal mineral estate and non-federal minerals. Operators would not be able to develop new roads through ROW exclusion areas to access mineral resources, and development of new roads through ROW avoidance areas would be difficult.

Applying a three percent cumulative disturbance cap would cause land uses on private, state, and other surface lands to have a cumulative impact on mineral materials in the planning area. If activities on private, state, and other surface lands disturbed the full three percent of the GRSG habitat in the planning area, no further activities would be allowed on BLM-administered surface or on federal mineral estate. This would include mineral material development.

As described in **Section 3.1.1**, Fluid Leasable Minerals, Oregon is considered a pioneering area for fluid minerals. As such, oil and gas is not expected to be developed in the state unless economic conditions change. However, testing for natural gas is planned in the Vale District. Geothermal resources also exist throughout the planning area, and developers have expressed interest in extracting these resources in the foreseeable future.

#### **Alternative A**

Under Alternative A, 3,134,200 acres (10 percent) of the minerals in the planning area would remain closed to fluid mineral development, and another 906,000 acres (3 percent) would remain subject to NSO stipulations. Cumulative impacts of these closures and NSO stipulations would be of the type described under **Section 5.1.12**, Fluid Minerals. Additionally, 4,303,300 acres (14 percent) of the planning area would continue to be managed as ROW exclusion or avoidance areas. These avoidance or exclusion areas would make it difficult for new fluid mineral project developers to construct necessary facilities. Because of this, management of these areas could cumulatively impact fluid mineral development in the planning area, as described under **Section 5.1.12**.

#### **Alternative B**

The BLM would close 6,762,920 acres (21 percent) of the minerals in the planning area to fluid mineral development under Alternative B. The increase in acres closed compared to Alternative A represents 11 percent of the planning area. Approximately 796,800 acres (3 percent) of the minerals in the planning area would be subject to NSO stipulations. The decrease in acres subject to NSO stipulations, compared with Alternative A, is because acres subject to NSO stipulations under Alternative A would be closed under Alternative B.



Alternative B would also apply the three percent cap on disturbance within PPMAAs. If development on private, state, or other lands were to disturb three percent of PPMAAs, further development would not be allowed on BLM-administered lands or federal mineral estate. Because more of the planning area would be closed to fluid mineral development under Alternative B, the level of fluid mineral development in the planning area would likely decrease, compared with Alternative A. This decrease would reduce the supply of fluid minerals in Oregon and the United States and would impact the domestic energy mix, as described under **Section 5.1.12**.

Managing PPMAAs as ROW avoidance would not have a cumulative impact on fluid minerals because these areas would be closed to fluid mineral development under Alternative B. Managing PGMAAs as ROW avoidance areas (5,662,600 acres, or 18 percent of the planning area) would also reduce the level of new fluid mineral development in the planning area by restricting construction of new roads and pipelines.

#### **Alternative C**

The BLM would close 10,895,300 acres (34 percent) of the planning area to fluid mineral development. The increase in acres closed compared to Alternative A represents 24 percent of the minerals in the planning area. Approximately 791,800 acres (2 percent) of the minerals in the planning area would be subject to NSO stipulations. The decrease in acres subject to NSO stipulations is because acres subject to NSO stipulations under Alternative A would be closed under Alternative C. Because more of the planning area would be closed to fluid mineral development under Alternative C, the level of fluid mineral development would likely decrease, compared with Alternative A. This decrease would reduce the supply of fluid minerals in Oregon and the United States and would impact the domestic energy mix, as described under **Section 5.1.12**.

Managing occupied habitat as ROW exclusion areas would not have a cumulative impact on fluid minerals because these areas would be closed to fluid mineral development under Alternative C.

#### **Alternative D**

Under Alternative D, the BLM would close 3,604,400 acres (11 percent) of the minerals in the planning area to fluid mineral development. The increase in acres closed compared to Alternative A represents 1 percent of the planning area. Alternative D would also apply the three percent cap on disturbance within PPMAAs. If development on private, state, or other lands were to disturb three percent of PPMAAs, further development would not be allowed on BLM-administered lands or federal mineral estate.

The use of a buffer system surrounding GRSG leks would result in application of NSO stipulations to 3,787,900 acres (12 percent) of the minerals in the planning area. The increase in acres subject to NSO stipulations, compared to Alternative A, represents 9 percent of the planning area.

As discussed under **Section 5.1.12**, application of NSO stipulations could create cumulative closure effects if areas within NSO buffers were not reachable using directional drilling technology. This, in turn, could result in reduced fluid mineral development in the planning area.

Managing PPMAs as ROW avoidance areas would impact fluid mineral development within those areas by restricting access to those minerals, as described under **Section 5.1.12**. Because much of the federal mineral estate within PPMAs would be subject to NSO stipulations under Alternative D, the cumulative impacts on fluid minerals of managing PPMAs as ROW avoidance would be limited.

**Alternative E**

The cumulative impacts on fluid minerals are the same as those described under Alternative B.

**Alternative F**

The cumulative impacts on fluid minerals are the same as those described under Alternative C.

**5.1.13 Locatable Minerals**

The cumulative impact analysis area used to analyze cumulative impacts on locatable minerals is the planning area, which covers 31,756,500 acres.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect locatable minerals are existing and planned locatable mineral operations on nonfederal mineral estate within the planning area. Locatable mineral activity is occurring throughout the planning area, and there is interest in additional development of locatable mineral resources within GRS habitat. There is also interest in uranium development in the Vale District. Reasonably foreseeable development scenarios and mineral potential reports were not completed for this RMPA/EIS. Therefore, all estimates of future activity are based on **Table 5-I** and on the BLM's assessment of locatable mineral trends.

Withdrawing an area from locatable mineral entry precludes locatable mineral resource development in that area. This would decrease the total amount of locatable mineral development in the planning area. It would in turn reduce the amount of locatable minerals available to markets within Oregon and the United States, which could impact industries that depend on these minerals. For example, high tech industries and renewable energy developers depend on certain locatable minerals as raw materials. If these minerals were to become scarcer as a result of the withdrawals recommended under this RMPA/EIS, additional imported materials could be required.

Applying a three percent cumulative disturbance cap would cause land uses on private, state, or other surface lands to have a cumulative impact on locatable

minerals in the planning area. Activities on private, state, or other surface lands could disturb the full three percent of the GRSG habitat in the planning area. In such a case, plans of operation for locatable mineral development on BLM-administered surface or on federal mineral estate would be required to incorporate mitigation measures to avoid further surface disturbance.

#### **Alternative A**

Under Alternative A, 996,800 acres would remain withdrawn from locatable mineral entry, and 20,500 acres would be recommended for withdrawal, for a total of 1,017,300 acres (3 percent of the planning area). Locatable mineral development would still be allowed in the remaining 97 percent of the planning area, with limited impacts on supply from withdrawals.

#### **Alternative B**

In addition to the 996,800 withdrawn acres, the BLM would recommend for withdrawal 4,490,500 acres, for a total of 5,487,300 acres (17 percent of the planning area). The increase in acres withdrawn or recommended for withdrawal between Alternative A and Alternative B represents 14 percent of the planning area. If all of these acres were withdrawn by Secretarial Order or Act of Congress, locatable mineral development and availability in the planning area would decrease, with the effects described under **Section 5.1.13**. Alternative B would also apply the three percent cap on disturbance within PPMAs. If development on private, state, or other lands were to disturb three percent of PPMAs, further development would not be allowed on BLM-administered lands or federal mineral estate.

#### **Alternative C**

In addition to the 996,800 withdrawn acres, the BLM would recommend for withdrawal 9,653,400 acres, for a total of 10,650,200 acres (34 percent of the planning area). The increase in acres withdrawn or recommended for withdrawal between Alternative A and Alternative C represents 31 percent of the planning area. If all of these acres were withdrawn by Secretarial Order or Act of Congress, locatable mineral development and availability in the planning area would decrease, with the effects described under **Section 5.1.13**. This alternative would have the greatest cumulative impacts because it recommends the most acres for withdrawal.

#### **Alternative D**

The cumulative impacts on locatable minerals are similar to those under Alternative A. However, Alternative D would apply the three percent cap on disturbance within PPMAs. If development on private, state, or other lands were to disturb three percent of PPMAs, further development would not be allowed on BLM-administered lands or federal mineral estate.

#### **Alternative E**

The cumulative impacts on locatable minerals are the same as those under Alternative B.

**Alternative F**

The cumulative impacts on locatable minerals are the same as those under Alternative B.

**5.1.14 Mineral Materials (Salables)**

The cumulative impact analysis area used to analyze cumulative impacts on mineral materials is the planning area, which covers 31,756,500 acres.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect mineral materials are existing and planned mineral material development projects on nonfederal mineral estate within the planning area. Reasonably foreseeable development scenarios and mineral potential reports were not completed for this RMPA/EIS. Therefore, all estimates of future activity are based on **Table 5-1** and on the BLM's assessment of mineral material trends.

Closing areas to mineral material disposal would decrease the level of mineral material development within the planning area. This would reduce the available supply of minerals for construction projects. Because construction typically uses mineral materials from nearby, the decrease in locally available supplies would impact the feasibility of these projects. For example, development for renewable energy, fluid minerals, locatable minerals, and nonenergy solid leasable minerals and highway construction all depend on mineral materials. These project developers would have to source mineral materials from farther away, or the projects may not be able to be completed if mineral materials are not locally available.

Applying a three percent cumulative disturbance cap would cause land uses on private, state, or other surface lands to have a cumulative impact on mineral materials in the planning area. If activities on private, state, or other surface lands were to disturb the full three percent of PPMA's in the planning area, no further activities, including mineral material development, would be allowed on BLM-administered surface or on federal mineral estate.

**Alternative A**

Under Alternative A, 2,752,500 acres (9 percent) of the planning area would continue to be closed to mineral materials disposal. Developers could not create new mineral material pits within these areas. The availability of mineral materials to supply construction projects on state, private, BLM-administered, or other lands would be reduced, as described under **Section 5.1.14, Mineral Materials (Salables)**.

**Alternative B**

The number of acres closed to mineral material disposal would increase to 7,105,500 acres (22 percent of the planning area). The increase in acres closed

to mineral material disposal compared to Alternative A represents 13 percent of the planning area.

More acres would be closed to mineral material disposal under Alternative B. Because of this, the availability of mineral materials to supply construction projects in the planning area would be reduced. Additionally, 5,662,600 acres within PGMAs would be managed as ROW avoidance areas.

This management would restrict development of construction projects, such as road building, that create demand for mineral materials. As such, it would reduce mineral material development in the planning area.

Alternative B would also apply the three percent cap on disturbance within PPMAs. If development on private, state, or other lands were to disturb three percent of PPMAs, further development would not be allowed on BLM-administered lands or federal mineral estate.

#### ***Alternative C***

The number of acres closed to mineral material disposal would increase to 10,682,100 acres (34 percent of the planning area). The increase in acres closed to mineral material disposal, compared to Alternative A, represents 25 percent of the planning area. More acres would be closed to mineral material disposal under Alternative C. Because of this, the availability of mineral materials to supply construction projects in the planning area would be reduced. This alternative would close the most acres to mineral material disposal and would therefore have the greatest cumulative impact within the planning area.

#### ***Alternative D***

Cumulative impacts on mineral materials are the same as those under Alternative B.

#### ***Alternative E***

Cumulative impacts on mineral materials are the same as those under Alternative B.

#### ***Alternative F***

As with Alternative B, the BLM would close 7,105,500 acres (22 percent) of the planning area to mineral material disposal. Therefore, the availability of mineral materials in the planning area would decrease. However, demand for mineral materials in the planning area would greatly decrease on the additional 5,669,400 acres (18 percent) of the planning area that would be managed as ROW exclusion. Therefore, new mineral material development would not occur on the 12,774,900 acres (40 percent) of the planning area that would be either closed to mineral material disposal or closed to the activities that create demand for mineral materials.

#### **5.1.15 Nonenergy Leasable Minerals**

The cumulative impact analysis area used to analyze cumulative impacts on nonenergy leasable minerals is the planning area, which covers 31,756,500 acres.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely to continue to affect nonenergy leasable minerals are existing and planned nonenergy leasable development projects on nonfederal mineral estate within the planning area. Reasonably foreseeable development scenarios and mineral potential reports were not completed for this RMPA/EIS. Therefore, all estimates of future activity are based on **Table 5-1** and on the BLM's assessment of nonenergy leasable mineral trends.

As discussed in **Section 3.14**, Nonenergy Leasable Minerals, most nonenergy leasable mineral development in the planning area occurs on hardrock mineral deposits beneath acquired lands. The trends for these minerals are the same as those for locatable mineral activity, which is occurring throughout the planning area.

Closing areas to nonenergy leasable mineral development would reduce the availability of hardrock minerals from within the planning area. These minerals are necessary for raw materials in such sectors as high tech industries and renewable energy. Therefore, development in these planning area sectors could be impacted by reduced supplies of hardrock minerals from beneath acquired lands.

Applying NSO stipulations to nonenergy leasable mineral development restricts that development. This could either make such development impossible or cause developers to move to private, state, or other lands with similar resources that do not have such restrictions. Therefore, development of nonenergy leasables on federal mineral estate in the planning area could decrease as a result of NSO stipulations.

Applying a three percent cumulative disturbance cap would cause land uses on private, state, or other surface lands to have a cumulative impact on nonenergy solid leasable minerals in the planning area. If activities on private, state, or other surface lands were to disturb the full three percent of the GRSG habitat in the planning area, no further activities, including nonenergy solid leasable mineral development, would be allowed on BLM-administered surface or on federal mineral estate.

#### **Alternative A**

Approximately 3,134,200 acres (10 percent) of the planning area would remain closed to nonenergy solid mineral prospecting and leasing. These closures would reduce the availability of hardrock minerals in the planning area, as described under **Section 5.1.15**.

**Alternative B**

The BLM would close 7,157,800 acres (23 percent) of the planning area to nonenergy solid mineral prospecting and leasing. The increase in acres closed compared with Alternative A represents 13 percent of the planning area. Because more of the planning area would be closed to nonenergy solid leasable mineral development under Alternative B, the cumulative impacts of reduced supplies of hardrock minerals would be more severe. Alternative B would also apply the three percent cap on disturbance within PPMAs. If development on private, state, or other lands were to disturb three percent of PPMAs, further development would not be allowed on BLM-administered lands or federal mineral estate.

**Alternative C**

The BLM would close 11,085,800 acres (35 percent) of the planning area to nonenergy solid mineral prospecting and leasing. The increase in acres closed compared with Alternative A represents 25 percent of the planning area. Because more of the planning area would be closed to nonenergy solid leasable mineral development under Alternative C, the cumulative impacts in the form of reduced supplies of hardrock minerals would be more severe. Alternative C represents the most restrictive management of nonenergy solid leasable minerals. For this reason, it have the greatest cumulative impacts within the planning area.

**Alternative D**

The BLM would apply NSO stipulations to nonenergy solid mineral leases on 4,756,900 acres (15 percent) of the planning area. Like Alternative A, 3,134,200 acres (10 percent) of the planning area would remain closed to nonenergy solid mineral prospecting and leasing.

Areas would be subject to NSO stipulations under Alternative D, where they would not be subject to those stipulations under Alternative A. As such, nonenergy leasable mineral development in the planning area would be more restricted under Alternative D. Development of nonenergy leasable minerals on federal mineral estate in the planning area may decrease, with the supply impacts described under **Section 5.1.15**.

Alternative D would also apply the three percent cap on disturbance within PPMAs. If development on private, state, or other lands were to disturb three percent of PPMAs, further development would not be allowed on BLM-administered lands or federal mineral estate.

**Alternative E**

Cumulative impacts on nonenergy leasable minerals are the same as those under Alternative B.

**Alternative F**

Cumulative impacts on nonenergy leasable minerals are the same as those under Alternative B.

**5.1.16 Special Designations**

This cumulative impact analysis focuses on Areas of Critical Environmental Concerns. This is the only special designation discussed in **Section 3.15**, Special Designations, which would be affected by any of the alternatives.

Past, present, and reasonably foreseeable actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect ACECs are any that would impact the relevant and important values for which the ACECs were established (e.g., GRS habitat health). Such actions are surface-disturbing activities, wildland fires, increased recreational demands, and climate change.

Cumulative impacts on existing ACECs under the various alternatives could result from actions and decisions not associated with the BLM on lands next to ACECs. While protections exist within the ACECs, population growth, development, and recreation throughout the planning area could, over time, encroach on these areas. The ACEC values could be degraded by such as factors as unauthorized off-route travel, trash dumping, increased noise, air pollution, and light pollution. Other impacts include species displacement, habitat fragmentation, and changes to the visual landscape that could affect resources within ACECs. Impacts would be greater where recreation areas or development are next to an ACEC.

There are a few proposed transmission lines and pending energy development projects within the planning area. If these transmission lines, facilities, or associated roads were to run through or be next to any of the ACECs, it could damage the relevant and important values for which these ACECs are designated. Future transmission line construction, energy development, and roads in the planning area could result in cumulative impacts on existing ACECs. Examples of long-term impacts on the ACEC from these activities are noise, heavy vehicle traffic, and dust.

Ongoing weed treatment, fuels management, and restoration projects in the planning area could also result in short-term cumulative impacts on ACECs; however, they would likely improve ACEC values in the long term by maintaining natural vegetation.

Climate change could also pose a long-term threat of cumulative impacts on the relevant and important values of ACECs. Cumulative impacts on GRS habitat, and consequently on the ACEC, from climate change could include vegetation regime changes (e.g., from sagebrush to grasslands) and increased wildfire potential due to drought (Connelly et al. 2004).



**Alternatives Analysis**

All action alternatives would restrict such activities as ROW development, livestock grazing, mineral entry, and new road construction. This could indirectly protect ACECs. Additionally, ACEC management includes restrictions, such as the application of NSOs, that protect ACECs from uses and actions that would impair important and relevant values. Despite these protections, over time ACECs could experience cumulative impacts from existing and future ROWs, oil, gas, and geothermal development, and travel routes in the vicinity. Impacts are described in **Section 4.15.2**, Nature and Type of Effects, and include impacts such as soil erosion, disturbance of GRSG populations and vegetation due to construction, operation and maintenance, and habitat fragmentation.

The seven ACECs that identify GRSG as an important and relevant value could experience additional protections. They could have more restrictions on resource uses and surface-disturbing activities than ACECs that do not identify GRSG as an important and relevant value. Moreover, the 59 ACECs identified in **Appendix I**, Greater Sage-Grouse Habitat Density in Areas of Critical Environmental Concern, as having high percentages of GRSG habitat are also more likely to experience protections from GRSG management actions.

Under Alternatives C and F, new ACECs would be created for the important and relevant value of GRSG. Additionally, under Alternative D, ACECs with large proportions of GRSG habitat would be managed for GRSG conservation, and, as such, would restrict resource uses within those ACECs. The ACECs under Alternatives C, D, and F would be less likely to experience cumulative degradation to their important and relevant values due to management actions focused on GRSG conservation.

The BLM would adaptively manage to protect ACEC values and minimize impacts where applicable and feasible.

**5.1.17 Soil Resources**

The cumulative impact analysis area used to analyze cumulative impacts on soils covers the planning area. Under all alternatives, federal and state laws, regulations, standards, assessments, and BMPs would be applied to rangeland management, ROW authorizations, travel management, and mineral development. Under all alternatives, the BLM would continue to authorize ROW development and temporary surface disturbance on a case-by-case basis. Effects under the different alternatives are the result of the number of acres open or closed to surface disturbance.

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect soil resources are those associated with surface-disturbing activities.

Disturbing land surface can expose soils to wind and rain, which can increase soil erosion rates and compact the soil. This may increase surface runoff and result in less vegetation due to the creation of root restrictive soil layers.

Management programs that disturb land surface are livestock grazing and wild horse and burro management, travel management designations, lands and realty management and associated transmission lines, wildland fire management, vegetation management, and energy and mineral development. Projects that initially disturb the surface but eventually improve soil health are improvement and restoration projects that are based on vegetation and habitat management objectives and wildland fire management.

Operations and developments that impact soil surface are ROW authorizations and associated transmission lines, roads granted under the lands and realty program, and mineral and energy development projects approved by the mineral program.

Planned and reasonably foreseeable projects and actions that may affect soil resources within the planning area are 5 ROW authorizations involving 4 transmission lines, and a communication site upgrade; 9 energy and mineral developments, involving a natural gas project, 3 wind energy projects, and 5 mineral developments; 24 vegetation management projects, including 7 fire-specific projects and 4 projects specifically dealing with invasive weeds; a recreation plan that involves building new facilities and trails; a district-wide wild horse gather; and 37 livestock grazing permit renewals. These projects, developments, and land management actions are detailed in **Table 5-1**.

Alternative C would be the most restrictive alternative and therefore the most protective of soil resources. Alternative F would be the second most restrictive, and Alternative B would be the third. Alternative A would be the least restrictive, while Alternatives D and E would be more restrictive than A, but less restrictive than B, F, or C. Alternative D would be more restrictive than E. From the most restrictive to the least restrictive, the alternatives are C, F, B, D, E, and A.

Under all alternatives, vegetation management would occur. Of the 24 vegetation management projects, 10 would use prescribed fire or pile burning to reduce hazardous fuels and juniper pine expansion. Four more projects would reduce hazardous fuels through mechanical removal, and three more would focus on post-fire stabilization and rehabilitation through reseedling.

Vegetation management projects would have the same effects on soil resources under any chosen alternative. Fire management disturbs and compacts soil during mechanical removal of vegetation and prescribed fire treatment; however, fuels reduction and fuel breaks allow for better management and better response to an active wild fire. They also may decrease the number of acres burned during a fire.

A fire of any size can impact soil resources through the loss of stabilizing vegetation cover. This would increase erosion rates. Depending on its severity and intensity, fire can alter the soil's physical, chemical, and biological properties and open the area burned to potential invasive weeds. After-fire stabilization and reseedling can reduce overall erosion of the exposed soil from wind and water and can reduce the potential for weed invasion.

The remaining vegetation management projects focus on reducing weeds in the planning area (four projects) and vegetation management (five projects), mainly removing juniper pine in an effort to return vegetation communities to historic compositions. Vegetation management is initially disturbing to soils when undesirable vegetation is removed and native seed is planted using heavy equipment that rips up soils. Success of vegetation management may not improve soil health for years after the initial disturbance.

#### **Alternative A**

Under Alternative A, current management would continue on BLM-administered lands in the planning area. There would be no PPMA or PGMA designated, and most land use plans would not implement use restrictions (e.g., ROW exclusion, travel management restrictions, livestock grazing closures, and energy and mineral development closures) to protect GRSG habitat. Planned ROW construction may increase compaction and erosion of soils. This would be the case if associated roads, transmission lines, or pipelines were cleared of vegetation and constructed. Also, new fluid mineral developments would increase loss of vegetation cover through both permanent and temporary roads, drilled wells and associated well pads, and soil excavations during mineral extraction. In addition, fluid mineral development may require associated pipelines and transmission lines, along with the construction of necessary service roads for these facilities.

Some use restrictions would be implemented, which would protect soils in these areas from degradation or removal. Overall, Alternative A would allow the highest level of surface disturbance of all alternatives; therefore, Alternative A would provide for the most possible impacts on soil resources from ROW and mineral developments, livestock grazing, and travel management.

#### **Alternative B**

Under Alternative B, PPMA and PGMA would be designated as ROW exclusion and avoidance areas. This would concentrate potential impacts from ROW authorizations and associated road or transmission line projects to nonhabitat areas. Alternative B would provide for more ROW exclusion acres than Alternatives A, D, and E and less ROW exclusions acres than Alternatives C and F. ROW exclusion areas are protected from surface-disturbing activities of ROW authorizations and associated roads and structures.

Alternative B would close fewer acres to livestock grazing than Alternatives D, C, and F. It would close the same number of acres to livestock grazing as

Alternatives A and E. The 37 planned livestock grazing permit renewals may be impacted, depending on their location to the livestock grazing closures.

Alternatives B, D, and F would all manage 7,996,000 acres as restricted to existing trails. This is more than Alternatives A and E and less than Alternative C. More restriction on cross-country travel may result in more predictable, localized, and manageable impacts on soil resources. Alternatives B, C, D, and F would manage 300,300 of acres as closed to cross-country travel management, which is greater than Alternatives A and E. Overall, Alternative B would provide for more travel restrictions than Alternative, A and E, the same amount as Alternatives D and F, and less than Alternative C.

Alternative B has more acres closed or withdrawn from energy and mineral development (locatables, leasables, nonenergy leasables, and mineral materials) than Alternatives A and D. It has the same number of acres closed as Alternative E and fewer acres closed to energy and mineral development than Alternatives C and F. Alternatives B and F have the same amount of closures to locatable mineral entry, mineral material disposal, and nonenergy leasable minerals. Alternative B has fewer acres closed to fluid mineral leasing than Alternative F. Alternatives B and D have the same amount of mineral material disposal, and Alternative B has more acres closed to nonenergy leasables, fluid mineral leasing, and locatable mineral entry than Alternative D. Alternative B would provide for more protection of soil resources from mineral and energy development than Alternatives A and D and the same amount of protection as Alternative E.

Overall, Alternative B would be more protective of soil resources than Alternatives A and D and less protective than Alternatives C and F. While Alternatives B and E are similar in their amount of closures to mineral resources, Alternative B has more closures to livestock grazing, more ROW exclusion areas, and more acres restricted to existing roads and trails than Alternative E. This makes Alternative B more protective of soil resources than Alternative E.

#### **Alternative C**

Alternative C would remove all grazing from the project area. This would eliminate any impacts on soil resources from livestock grazing, including trampling of vegetation and compaction of soil near water resources. Alternative C would not allow for the renewal of the 37 livestock grazing permits that are reasonably foreseeable actions.

Alternative C would also close the most acreage to mineral entry, which may prevent some of the 15 planned energy and mineral development projects.

Additionally, Alternative C would have the greatest amount of ROW exclusion and avoidance areas and would limit the most amount of acreage to existing routes under travel management. Alternative C would concentrate ROW

authorization and associated transmission lines and roads outside of GRSG habitat and would concentrate impacts from travel management to existing route areas.

Due to the extent of land closures, Alternative C would provide the most protection of soil resources. Alternative C would also result in the most restrictions to the cumulative effects projects. It may prohibit new ROW authorization and developments and mineral and energy development. As a result, Alternative C would result in the greatest reduction in cumulative effects from past, present, and reasonably foreseeable actions, compared to all alternatives.

#### **Alternative D**

ROW exclusion areas under Alternative D would be the same as Alternative A, and ROW avoidance areas would increase by 2,519,000 acres. The overall effects of lands and realty management are very similar to Alternative A because an increase in ROW avoidance areas does not prohibit ROW authorizations.

Alternative D would be more protective of soil resources from the potential effects of livestock grazing than Alternatives A, B, or E due to more closures to livestock grazing. It would be less protective of soils than Alternatives C and F.

Alternative D would have more restrictions on cross-country travel than Alternatives A and E. It would have the same number of restrictions as Alternatives B and F and fewer than Alternative C.

Alternatives D and A would manage the same amount of closures to locatable mineral entry, fluid mineral leasing, and nonenergy leasables. It would recommended the same amount for acreage for withdrawal for locatable mineral entry. Alternative D would provide for more closures to mineral materials than Alternative A. Overall, Alternative D is more protective of soil resources from mineral development than Alternative A, due to more closures to mineral materials. However, it is less protective of energy and mineral development than Alternatives B, C, E, and F.

Alternative D would be more protective of soil resources than Alternatives A and E from potential impacts from livestock grazing and travel management due to more closures. However, it would be less protective of soil resources from ROW authorizations and associated development and from energy and mineral development than under Alternatives B, C, D, and E.

#### **Alternative E**

Alternative E would manage for the fewest ROW exclusion areas. It would be less protective of soil resources from the potential effects of ROW authorizations and associated development than Alternatives B, C, and F.

The effects on soil resources from ROW authorizations under Alternative E are similar to those under Alternatives A and D. Alternative E would be less protective of soil resources from the potential effects of livestock grazing than Alternatives B, C, and F. It would have the same number of closures as Alternatives A and D.

The effects on soil resources from livestock grazing under Alternative E are similar to those under Alternatives A and D. Alternative E would manage more acres as restricted to existing roads and trails for cross-country travel as Alternative A but fewer than Alternatives B, C, D, and F.

Energy and mineral development under Alternative E would be managed the same as under Alternative B. As a result, the cumulative impacts from past, present, and reasonably foreseeable actions would be reduced, compared to Alternative A, but to a lesser extent than the other action alternatives.

#### **Alternative F**

Alternative F would have the same amount of acreage managed as ROW avoidance and exclusion areas as Alternative C. Alternative F would manage the same amount of acreage as limited to existing roads and trails as Alternatives B and D, which are more than Alternatives A and E and less than Alternative C. Alternative F would manage more acres as closed to livestock grazing as Alternatives A, B, D and E and fewer acres than Alternative C. Alternative F would manage the largest the category of acreage as closed to fluid mineral leasing and the second largest amount of acres closed under nonenergy solid leasables, locatables, and mineral material sales.

Alternative F would be less restrictive of surface-disturbing activities than Alternative C, but it would be more restrictive than Alternatives A, B, D, and E. Alternative F could restrict the ROW and mineral developments in **Table 5-1**, which would prevent any impacts on soil resources from these projects.

### **5.1.18 Water Resources**

The area used to analyze cumulative impacts on water resources is the entire planning area. Under all alternatives, federal and state laws, regulations, standards, assessments, and BMPs would be applied to rangeland management, ROW authorizations, travel management, and mineral development. Under all alternatives, the BLM would continue to authorize ROW development and temporary surface disturbance on a case-by-case basis. Effects under the different alternatives are the result of the number of acres open or closed to a surface-disturbing activity.

Past, present, and reasonably foreseeable actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect water resources are vegetation and habitat management and improvement projects, livestock grazing management, lands and realty management, recreation, travel management, and energy and mineral development.

These management actions disturb land surface; surface-disturbing activities may result in vegetation trampling or clearing and excavation of surface materials, which may increase sedimentation in waterways. In addition livestock may use riparian and wetland areas for water and shade and may congregate around water developments. This would result in compacted soil, decreased water quality due to fecal coliforms, trampled nearby vegetation, and reduced riparian community conditions and hydrologic functionality. These effects could negatively impact water resources, depending on their proximity to waterways, the timing of surface disturbance, local vegetation, and their location in the watershed. The more acreage an alternative closes to surface-disturbing activities, the more protection the alternative affords water resources by eliminating the potential for impact.

Planned and reasonably foreseeable projects and actions that may affect water resources within the planning area are 5 ROW authorizations, involving 4 transmission lines, and a communication site upgrade; 9 energy and mineral developments, involving a natural gas project, 3 wind energy projects, and 5 mineral developments; 24 vegetation management projects, including 7 fire-specific projects and 4 projects specifically dealing with invasive weeds; a recreation plan that involves building new facilities and trails; a district-wide wild horse gather; and 37 livestock grazing permit renewals. These projects, developments, and land management actions are detailed in **Table 5-1**.

As discussed below by alternative, Alternative C would be the most restrictive and therefore the most protective of water resources. Alternative F would be the second most restrictive, and Alternative B would be the third. Alternative A would be the least restrictive, while Alternatives D and E would be more restrictive than Alternative A but less restrictive than Alternatives B, F, or C. Alternative D would be more restrictive than E. From the most restrictive to the least restrictive, the Alternatives are C, F, B, D, E, A.

Vegetation would be managed under all alternatives. Of the 24 vegetation management projects, 10 would use prescribed fire or pile burning to reduce hazardous fuels and to reduce juniper pine expansion. Four projects would reduce hazardous fuels through mechanical removal, and three would focus on post-fire stabilization and rehabilitation through reseeding. Vegetation management projects would have the same effects on water resources under any chosen alternative.

The effects of fire on water resources are determined largely by the severity of the fire, the decisions made relative to any suppression activities, and the immediate post-fire precipitation. Effects of fire on water resources can occur under all alternatives and can include a short-term decrease in water quality. This would be due to increased particulate loads and stream flow and average storm flow discharge as a result of lower vegetation density and reduction in

litter cover. After-fire stabilization and reseeded can reduce overall erosion of the exposed soil from wind and water.

The remaining vegetation management projects focus on reducing weeds in the planning area (four projects) and vegetation management (five projects), mainly removing juniper pine to return vegetation communities to historic compositions. Direct effects of vegetation management may temporarily decrease water quality through increased sedimentation of waterways from undesirable vegetation clearing or burning. The long-term effects of vegetation management would protect water quality by reducing runoff and sedimentation into surface waters through stabilizing soils with vegetation.

#### **Alternative A**

Under Alternative A, current management would continue on BLM-administered lands in the planning area. There would be no PPMA or PGMA designated. Most land use plans would not implement use restrictions (e.g., ROW exclusion, travel management restrictions, livestock grazing closures, and closure to energy and mineral development) to protect GRSG habitat. Planned ROW construction would be permitted with conditions of approval. These include that the holder of the rights comply with the Water Quality Act and other federal and state laws, which would protect water resources from degradation.

Potential impacts from locatable mineral, mineral material, nonenergy leasable, and fluid leasable mineral activity often result from violation of mineral regulations. These can include the release of pollutants capable of contaminating surface water or aquifers during groundwater recharge as a result of use, storage, and transportation of hazardous fluids and compounds. Impacts from mineral activity are regulated and mitigated through federal and state laws, as well as handbooks, stipulations, and conditions of approval. These measures have effectively reduced the potential of surface or groundwater contamination.

Some use restrictions would be implemented, which would protect soils in these areas from degradation or removal. Overall, Alternative A would allow the highest level of surface disturbance of all alternatives; therefore, it would provide for the most possible impacts on water resources from ROW and mineral developments, livestock grazing, and travel management.

#### **Alternative B**

Under Alternative B, PPMA and PGMA would be designated as ROW exclusion and avoidance areas. This would concentrate potential impacts from ROW authorizations and associated road or transmission line projects in nonhabitat areas. Alternative B would provide for more ROW exclusion acres than Alternatives A, D, and E and fewer ROW exclusions acres than Alternatives C and F. ROW exclusion areas are protected from the surface-disturbing activities of ROW authorizations and associated roads and structures.



Alternative B would have fewer acres closed to livestock grazing than Alternatives D, C, and F. It would have the same amount of closure to livestock grazing as Alternatives A and E. The 37 planned livestock grazing permit renewals may be impacted, depending on their location to the closures to livestock grazing.

Alternatives B, D, and F would all manage 7,996,000 acres as restricted to existing trails. This is more than Alternatives A and E and less than Alternative C. More restrictions on cross-country travel may result in more predictable, localized, and manageable impacts of soil erosion into water resources. Alternatives B, C, D, and F would manage 300,300 of acres as closed to cross-country travel management, which is greater than Alternatives A and E. Overall, Alternative B would provide for more travel restrictions than Alternatives A and E, the same amount as Alternatives D and F, and fewer than Alternative C.

Alternative B has more acreage closed or withdrawn from energy and mineral development (locatables, leasables, nonenergy leasables, and mineral materials) than Alternative A and D. It has the same number of closed acres as Alternative E and fewer acres closed to energy and mineral development than Alternatives C and F. Alternative B and F have the same number of closures to locatable mineral entry, mineral material disposal, and nonenergy leasable minerals. Alternative B has fewer acres closed to fluid mineral leasing than Alternative F. Alternatives B and D have the same amount of mineral material disposal, and Alternative B has more acres closed to nonenergy leasables, fluid mineral leasing, and locatable mineral entry than Alternative D. Alternative B would provide for more protection of water resources from mineral and energy development than Alternatives A and D and the same amount of protection as Alternative E.

Overall, Alternative B would be more protective of water resources than Alternatives A and D and less protective than Alternatives C and F. While Alternatives B and E are similar in their number of closures to mineral resources, Alternative B has more closures to livestock grazing, more ROW exclusion areas, and more acres restricted to existing roads and trails than Alternative E. This makes Alternative B more protective of water resources than Alternative E.

### **Alternative C**

Alternative C would remove all grazing from the project area, which would eliminate any impacts on water resources from livestock grazing, including vegetation trampling and soil compaction near water resources. Alternative C would not allow for the renewal of the 37 livestock grazing permits that are reasonably foreseeable actions.

Alternative C would also close the most acres of all alternatives to mineral entry, which may prevent some of the 15 planned energy and mineral development projects.

Additionally, Alternative C would have the most ROW exclusion and avoidance areas and would limit the most acres to existing routes under travel management. Alternative C would concentrate ROW authorization and associated transmission lines and roads outside of GRSG habitat and would concentrate impacts from travel management to existing routes.

Due to the extent of land closures, Alternative C would be most protective of water resources of all the alternatives. Alternative C would also most restrict the cumulative effects projects. It may prohibit new ROW authorization and developments and mineral and energy development. As a result, Alternative C would result in the greatest reduction in cumulative effects from past, present, and reasonably foreseeable actions.

#### **Alternative D**

ROW exclusion areas under Alternative D would be the same as Alternative A, and ROW avoidance areas would increase by 2,519,000 acres. The overall effects of lands and realty management are very similar to Alternative A. This is because an increase in ROW avoidance areas does not prohibit ROW authorizations.

Alternative D would be more protective of water resources from the potential effects of livestock grazing than Alternatives A, B, and E, due to more closures to livestock grazing, and less protective than Alternatives C and F.

Alternative D would have more restrictions to cross-country travel than Alternatives A and E. It would have the same level of restrictions as Alternatives B and F and fewer restrictions than Alternative C.

Alternatives D and A would manage the same number of closures to locatable mineral entry, fluid mineral leasing, and nonenergy leasables. It would recommended the same number for acres for withdrawal from locatable mineral entry. Alternative D would provide for more closures to mineral materials than Alternative A. Overall, Alternative D is more protective of water resources from mineral development than Alternative A. This is because it calls for more closures to mineral materials but is less protective of energy and mineral development than Alternatives B, C, E, and F.

Because it calls for more closures, Alternative D would be more protective of water resources than Alternatives A and E from potential impacts of livestock grazing and travel management. However, it would be less protective of water resources from ROW authorizations and associated development and energy and mineral development than under Alternatives B, C, D, and E.

#### **Alternative E**

Alternative E would manage of the fewest ROW exclusion areas. It would be less protective of water resources from the potential effects of ROW authorizations and associated development than Alternatives B, C, and F. The

effects on water resources from ROW authorizations under Alternative E are similar to those under Alternatives A and D.

Alternative E would be less protective of water resources from the potential effects of livestock grazing than Alternatives B, C, and F. It calls for the same number of closures as Alternatives A and D. The effects on water resources from livestock grazing under Alternative E are similar to those under Alternatives A and D. Alternative E would restrict more acres to existing roads and trails for cross-country travel as Alternative A but fewer acres than Alternatives B, C, D, and F. Energy and mineral development under Alternative E would be managed the same as under Alternative B. As a result, the cumulative impacts from past, present, and reasonably foreseeable actions would be reduced, compared to Alternative A, but to a lesser extent than under the other action alternatives.

#### **Alternative F**

Alternative F would have the same number of acres managed as ROW avoidance and exclusion areas as Alternative C. Alternative F would manage the same number of acres as limited to existing roads and trails as Alternatives B and D. This is more than Alternatives A and E and less than Alternative C. Alternative F would manage more acres as closed to livestock grazing as Alternatives A, B, D and E and fewer acres than Alternative C. Alternative F would manage the largest category of acreage as closed to fluid mineral leasing and the second largest number of acres closed under nonenergy solid leasables, locatables, and mineral material sales.

Alternative F would be less restrictive of surface-disturbing activities than Alternative C, but it would be more restrictive than Alternatives A, B, D, and E. Alternative F could restrict the ROW and mineral developments in **Table 5-1**.

#### **5.1.19 Lands with Wilderness Characteristics**

Past, present, and reasonably foreseeable actions and conditions in the cumulative impact analysis area that have affected and will likely continue to affect lands with wilderness characteristics are wildland fires, wildland fire management, energy development, mining, noxious weed invasion, increased recreation demand, livestock grazing, ROWs, and road construction. Continued travel management and recreation development in the planning area could increase visitor use on BLM-administered lands. This includes lands with wilderness characteristics and could affect wilderness characteristics if it were to reduce the opportunities for solitude.

Development of energy and minerals resources could introduce sights, noises, and infrastructure in or next to lands with wilderness characteristics, which could impair the feeling of solitude and degrade naturalness.

In addition, vegetation management on public and private lands could alter landscape appearance and setting in the short and long term, protecting or degrading wilderness characteristics, depending on the activity.

Cumulative impacts on lands with wilderness characteristics would be mitigated where management actions governing other resources threaten wilderness characteristics.

#### **Alternatives Analysis**

Cumulative impacts would be most likely to damage lands with wilderness characteristics under Alternative A. This is because the fewest restrictions on present and future resource uses are in place under this alternative. Management under the action alternatives would protect wilderness characteristics to some degree, and GRSG, by placing restrictions on development and land uses. Such restrictions would indirectly limit cumulative impacts on wilderness characteristics. Alternatives C and F place broader and more stringent restrictions on allowable uses of resources in GRSG habitat; consequently, they would provide more indirect protections to lands with wilderness characteristics and would be less likely to have cumulative impacts that would degrade those characteristics.

#### **5.1.20 Social and Economic Conditions (Including Environmental Justice)**

Past, present, and reasonably foreseeable future actions and conditions within the cumulative impact analysis area that have affected and will likely continue to affect social and economic conditions are chiefly mining and mineral exploration and development, lands, realty, transportation, ROWs, renewable energy development, recreation, and livestock grazing.

The cumulative impact analysis area used to analyze potential impacts on social and economic conditions consists of the counties identified as the socioeconomic study area.

Changes to social and economic conditions result when individuals, businesses, governments, and other organizations initiate actions. Over the next several decades, millions of decisions will be made by thousands of residents of the counties in the socioeconomic study area and others. These decisions will affect trends in employment, income, housing, and property. Projections published by the Oregon Employment Department and the Oregon Office of Economic Analysis account for these individual decisions in the aggregate and provide a baseline for comparing effects of alternatives in the future.

The projections represent a regional forecast and take a range of actions into account: management actions by the BLM as well as many other government entities, private citizens, and businesses. As a result, they incorporate the past, present, and reasonably foreseeable projects that will form the basis of future economic and social trends in the cumulative impact analysis area.

Current and future trends in the cumulative impact analysis area are as follows:

- Population growth
- Demographic change
- Changes in supply, demand, and policy related to livestock grazing and other forms of agriculture
- Changes in recreation demands
- Renewable energy development
- Potential mining activity, including for gold, uranium, and salable minerals
- Other activities noted in **Section 4.19**, Social and Economic Impacts (Including Environmental Justice)

Some of the predicted employment and income effects of the actions considered in this EIS could be quantified. For the agriculture sector, the BLM used IMPLAN, a regional economic model, to calculate indirect and induced impacts of these actions. **Table 5-2**, Projected Employment by Alternative for Primary Socioeconomic Study Area, shows projected employment for 2020 in the seven counties of the primary study area, as forecast by the State of Oregon.

Because Alternative A represents current management plans, employment would correspond most closely to the existing forecasts. Employment under Alternatives C and F, especially, would change from the projections, with the best estimate for those changes being the quantities shown in Chapter 4, Environmental Consequences. Thus, **Table 5-2** shows the estimated change in employment for these alternatives, based on modifying the projected future employment by the estimated changes for the socioeconomic study area (from IMPLAN).

**Table 5-2**  
**Projected Employment by Alternative for Primary Socioeconomic Study Area**

Item	Alter- native A	Alter- native B	Alter- native C	Alter- native D	Alter- native E	Alter- native F
Employment (2010) <sup>1</sup>	42,147	42,147	42,147	42,147	42,147	42,147
Average annual change in future employment related to grazing <sup>2</sup>	N/A	0	-746	-4	0	-419
Average annual change in future employment related to wind energy development <sup>3</sup>	N/A	-61	-61	0	0	-61
Average annual change in future employment related to geothermal development <sup>3</sup>	N/A	-41	-89	0	-41	-89

**Table 5-2**  
**Projected Employment by Alternative for Primary Socioeconomic Study Area**

Item	Alter- native A	Alter- native B	Alter- native C	Alter- native D	Alter- native E	Alter- native F
Projected 2020 employment <sup>4</sup>	46,877	46,775	45,981	46,873	46,836	46,308
Percent change, 2010 to 2020	11.2%	11.0%	9.1%	11.2%	11.1%	9.9%

Source: Oregon Employment Department (2012) (current and projected employment data), modified by estimates from IMPLAN reported in Section 4.19. Annual changes shown include direct, indirect, and induced effects from IMPLAN; see Appendix R, Economic Impact Analysis Methodology, for a detailed description of this model.

<sup>1</sup>The source of 2010 employment data used in this table differs from that used in Section 3.20, Social and Economic Conditions (Including Environmental Justice), so there may be differences between the estimates shown.

<sup>2</sup>The values for livestock grazing represent the midpoint of the low and high scenarios described in Section 4.7, Livestock Grazing/Range Management.

<sup>3</sup>The values for wind energy and geothermal development include operation and construction jobs, with the latter assumed to be spread out over a 10-year construction period (e.g., 600 construction jobs in an alternative would mean about 60 construction jobs per year on average). Because construction is assumed to be distributed over ten years, the average annual operations jobs would be half of the estimated operations jobs when full capacity is installed.

<sup>4</sup>Where the underlying data sources do not provide county-level employment projections, they were imputed based on the county shares of current employment.

Changes in employment, especially under Alternatives C and F, would have a measurable effect on future employment, according to this analysis. Employment changes related to livestock grazing (including sectors that support and are supported by grazing), wind and geothermal development represent the only sectors that could be quantified for this analysis.

Under Alternatives A, B, D, and E, employment would increase by about 11 percent, with small reductions projected under Alternatives B, D, and E. Under these alternatives, the reduction would not likely be noticeable, given the size of the study area and the uncertainty associated with a long-term forecast. Under Alternatives C and F, employment would be projected to increase by somewhat less: 9.1 percent and 9.9 percent respectively. These reductions would be noticeable, but they would also be relatively small, given the size of the study area and the uncertainty inherent in long-term forecasting.

**Table 5-3**, Projected Earnings by Alternative for Primary Socioeconomic Study Area, shows projected changes in earnings, which parallel the projected changes in employment. Note that changes in geothermal earnings were not included in this table, due to lack of data. **Table 5-3** shows that Alternatives C and D would have a measurable although relatively small effect on future regional earnings.

Changes related to livestock grazing (including sectors that support and are supported by grazing) and wind energy development are the only sectors that could be quantified for the earnings analysis. The analysis indicates that under

**Table 5-3**  
**Projected Earnings by Alternative for Primary Socioeconomic Study Area**

Item	Alter- native A	Alter- native B	Alter- native C	Alter- native D	Alter- native E	Alter- native F
Earnings in 2010 <sup>1</sup>	\$3,294	\$3,294	\$3,294	\$3,294	\$3,294	\$3,294
Average annual change in future earnings related to grazing <sup>2</sup>	N/A	\$0	-\$23.5	-\$0.1	\$0	-\$13.2
Average annual change in future earnings related to wind energy development <sup>3</sup>	N/A	-\$2.8	-\$2.8	\$0	\$0	-\$2.8
Projected 2020 earnings <sup>4</sup>	\$5,249	\$5,246	\$5,223	\$5,249	\$5,249	\$5,233
Percent change, 2010 to 2020	59.4%	59.3%	58.6%	59.3%	59.4%	58.9%

Note: All dollar figures are in millions of year 2010 dollars.

Source: Oregon Office of Economic Analysis (2013; current and projected earnings data), modified by estimates from IMPLAN reported in Section 4.19. Annual changes shown include direct, indirect, and induced effects from IMPLAN; see Appendix R, Economic Impact Analysis Methodology, for a detailed description of this model.

<sup>1</sup>The source of 2010 earnings data used in this table differs from that used in Section 3.18, Social and Economic Conditions (Including Environmental Justice), so there may be differences between the estimates shown.

<sup>2</sup>The values for livestock grazing represent the midpoint of the low and high scenarios described in Section 4.19.

<sup>3</sup>The values for wind energy development include operation and construction earnings, with the latter assumed to be spread out over a ten-year construction period. Because construction is assumed to be distributed over ten years, the average annual operations earnings would be half of the estimated operations earnings when full capacity is installed.

<sup>4</sup>Where the underlying data sources do not provide county-level projections, they were imputed based on the county shares of current earnings.

Alternatives A, B, D, and E, earnings would increase by a little over 59 percent, with a small reduction projected under Alternatives B and D. A somewhat larger reduction would be projected under Alternatives C and F. Even here, the reduction would be barely noticeable, given the size of the study area and the uncertainty associated with a long-term forecast.

Of the effects documented in **Section 4.19**, the impact that most exacerbates current economic challenges is the potential for several of the management alternatives—especially Alternatives C and F—to increase costs for livestock grazing operators. Long-term trends, including changing market conditions, consolidation supported by economies of scale, demographic change, and environmental concerns, have increasingly challenged economic conditions for ranch operators, especially smaller operators.

Increased costs due to restrictions on vegetation treatments, infrastructure improvements, and other management elements could exacerbate existing trends. Increased costs also can create additional cumulative impacts for the livestock grazing and ranching sector. This in turn could have economic impacts over and above those identified in the employment and earnings projections shown. It could also result in social impacts since the grazing and ranching

industry has been quite influential in terms of establishing community character, identity, and social values across the region.

In this way, all of the alternatives would have some degree of cumulative social and economic impact related to grazing. Although AUMs would be reduced only under Alternatives C, D, and F, Alternatives B and E would also entail changes to management that could increase costs or decrease the flexibility of ranchers to manage their animals.

In terms of geographic regions, the cumulative effects on livestock grazing operators would occur throughout the socioeconomic study area, but would be most important in Harney, Lake, and Malheur Counties. **Section 4.19** provides additional information to characterize geographic differences as well as the potential for disproportionate impacts on low-income and minority populations.

Impacts on wind energy development would also have economic consequences for the study area, especially under Alternatives B, C, and F. However, under all alternatives, exclusion and avoidance areas could have some impact on wind energy development, although economic consequences are less likely under Alternatives A and E. Alternatives B, C, D, and F could all impose increased costs to future wind energy developers. This would result from routing transmission lines and access roads to avoid GRSG-occupied habitat and through mitigation measures. These increased costs could have a deterring effect on some future investments.

The other effect identified in **Section 4.19** that could lead to a cumulatively considerable contribution to impacts is potential fiscal effects. This would be especially the case in the smaller counties that are also more dependent on economic activities on BLM-administered lands. Because specific impacts on local government tax revenues could not be quantified, the nature of the potential cumulative effect is not possible to characterize beyond the analysis in **Section 4.19**. That analysis notes specific counties in which local tax revenues could be most affected by the management alternatives.

Impacts on geothermal development, although not quantified for the earnings analysis, could also have economic consequences for the study area as shown in the employment estimates. Although impacts would not be noticeable at the national level, management alternatives restricting geothermal development would have effects that would be cumulative and counter to national trends of growth of domestic renewable energy sources.

Other effects, including potential changes in economic activity related to mining, are expected to contribute to cumulative effects. There are no expected economic and social impacts of management changes on these sectors, as documented in **Section 4.19**.